

*Tech. Assist.
1-800-521-0098*

KODAK

EKTACHEM 

DT60 Analyzer

**SPECIFICATIONS FOR
COMPUTER INTERFACE**

March 1986



Eastman Kodak Company

343 State Street • Rochester, New York 14650

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MECHANICAL AND ELECTRICAL INTERFACES

1.1 MECHANICAL INTERFACE

An RS232-C communication port with a standard DB25F female connector is mounted on the interface adapter box, which is mounted on the chassis of the KODAK EKTACHEM DT60 Analyzer.

1.1.1 Data Pins*

- Pin 1: Protective Ground (AA)
- Pin 2: Transmitted Data (BA)
- Pin 3: Received Data (BB)
- Pin 7: Signal Ground (AB)

1.1.2 Transmit Control Pins*

- Pin 4: Request to Send (CA)
- Pin 5: Clear to Send (CB)
- Pin 6: Data Set Ready (CC)
- Pin 20: Data Terminal Ready (CD)

1.1.3 Transmission Distance

The cable, **provided by the user**, connects the analyzer to the computer and should not exceed 50 feet in length. A longer transmission distance may be possible by using a low capacitance cable and/or a reduced baud rate.

1.2 ELECTRICAL INTERFACE

Voltage levels and electrical characteristics will conform to and are defined by EIA Standard RS-232C, dated August 1969.

The factory default will be the DCE configuration. A jumper block in the adapter box allows the installer to configure the interface as a DTE device if preferred by the user.

*All unused pins must be left unconnected or damage may result to the computer or host interface. Eastman Kodak Company will not be responsible for damage caused due to improper connections.

2.1 METHOD OF TRANSMISSION

The asynchronous method of data transmission (serial-by-bit) with start/stop method of character and bit synchronization is used. All information transmitted is in character form and is represented by 7-bit ASCII. The 64-character ASCII subset of printable characters plus CR and LF are used.

2.2 PARITY

Parity for each character is configurable for odd, even, or none. Once selected, the same parity sense will apply to all input or output.

2.3 CHARACTER TRANSMISSION

Each character is transmitted in a 10-bit or 11-bit format:

- 1 start bit
- 7 or 8 data bits
- 0 or 1 parity bit
- 1 or 2 stop bits

The character frames possible, factory default settings, and transmission baud rates are listed in Figure 1.

To start the transmission mechanism, the transmit line (BA), or the receive line (BB), is brought to the "0" state, or a START bit is sent. It is followed by the data bits, of which the LSB is sent first and the parity is sent last. The STOP bit interval is transmitted last.

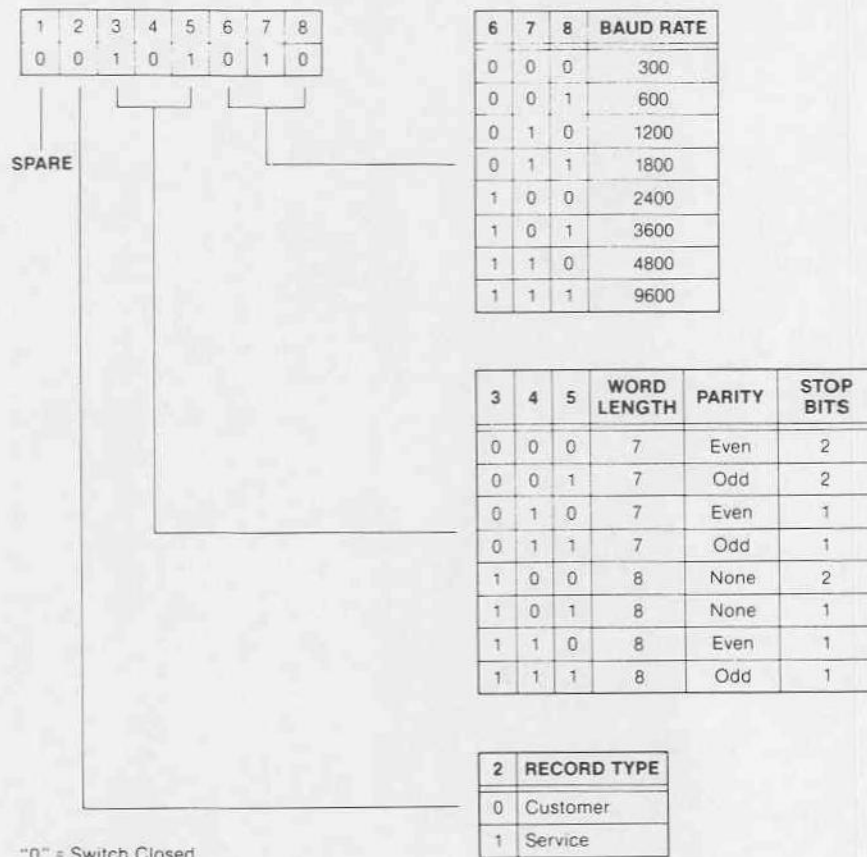


Figure 1. Configurable Switch Settings on the I/O Board.

A switch on the I/O board in the DT60 Analyzer allows the installer to select the standard baud rates from 300 to 9600 baud, number of character bits, number of stop bits, and even, odd, or no parity. One start bit is always sent. The factory set defaults are 1200 baud, 1 start bit, 8 character bits, no parity, and one stop bit. The possible configuration choices are shown on the previous page.

2.4 Communication Protocol

The communication protocol is a message-oriented, two-way transfer with replies and with longitudinal checking. The half-duplex mode of operation is used.

2.4.1 DT60 Analyzer as a DTE Device

After the hardware has finished initialization, the DTR line is asserted.

Each time data is ready for transmission, the analyzer will poll the status of data set ready (DSR). If DSR is asserted (i.e., a device is connected to the serial interface and is ready to receive data) the analyzer will internally software enable its transmitter, and send out a request-to-send (RTS) signal. Upon reception of a clear-to-send (CTS) signal, which hardware enables the analyzer's transmitter, the data will be transmitted. If DSR is not asserted, the data will not be transmitted out the serial port.

After the data has been transmitted, RTS will be reset, the analyzer's transmitter will be disabled, and its receiver enabled. The analyzer's receiver will be disabled after the acknowledgment from the computer is received. The analyzer allows 6 seconds for the transmission of a message, including the control line delay and an acknowledgment.

NOTE: If a positive acknowledgment is not sent by the computer, the potential exists that the data from the analyzer can be lost. Therefore, the computer should not accept transmitted data from the analyzer without responding with either a positive or negative acknowledgment.

Refer to the serial interface interconnect diagram showing the analyzer as a DTE device (Figure 2).

2.4.2 DT60 Analyzer as a DCE Device

After the analyzer has finished hardware initialization (power up of the analyzer) the RS232 DSR line is asserted. This signal is generated by the analyzer asserting its DTR* pin.

Each time data is ready for transmission, the analyzer will poll the status of the DTR, its DSR* input. If DTR is asserted, i.e., a DTE device is connected to the serial interface and is ready to receive data, the analyzer will enable its transmitter and send out an RTS* signal. The analyzer will then wait for a CTS* signal before transmitting the test data. If DTR is not asserted, the data will not be transmitted out the serial port. The CTS* signal can be generated by one of the following two methods.

*All asterisked signals refer to the analyzer's internal control lines. All non-asterisked signals refer to RS232 signals as they appear at the serial interface connector. Refer to the serial interface interconnect diagram showing the analyzer connected as a DCE device for details.

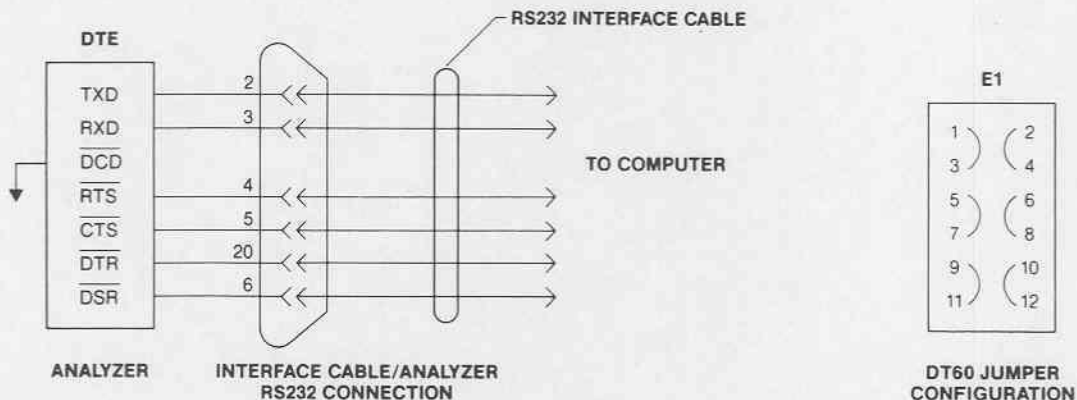


Figure 2. DT60 Analyzer Serial Interface Interconnect Diagram.

METHOD 1

RTS* is tied to a CTS* via jumpers in the analyzer's serial interface adapter box. The RTS is also connected to a CTS via jumpers in the serial interface adapter box. Refer to the serial interface interconnect diagram for details (Figure 3). This method assumes that the computer is always ready to receive data. The data transmission from the analyzer will proceed uninterrupted.

METHOD 2

After the analyzer asserts its RTS*, the CTS* would come from the RTS. Refer to the serial interface interconnect diagram (Figure 4) and note the interface cable "cross-connection". While this method allows the computer to interrupt the data transmission, note that the computer must be able to sense the analyzer's RTS* signal and be able to respond with a CTS* so that the data transmission and received acknowledgment can be completed within the timeout period.

After the data has been transmitted, the RTS* will be reset, the analyzer's transmitter disabled, and its receiver enabled. The analyzer's receiver will be disabled after the acknowledgment from the computer is received. The analyzer allows 6 seconds for the transmission of a message, including control line delay and an acknowledgement.

NOTES

- A. This connection is made via jumpers in the DT60 Analyzer adapter box (J5 to J6).
- B. This connection is made via jumpers in the DT60 Analyzer serial interface box (J7 to J9).
- C. This "cross-connection" is made on the customer supplied interface cable.

NOTE: If a positive acknowledgment is not sent by the computer, the potential exists that data from the analyzer can be lost. Therefore, the computer should not accept transmitted data from the analyzer without responding with either a positive or negative acknowledgment.

2.4.3 Message Protocol

The transmission of the message is completed and the message is deleted from the analyzer if:

1. The analyzer receives a positive acknowledgment from the computer before the time-out interval has been reached. A positive acknowledgment is the ASCII "plus".
2. The analyzer receives no acknowledgment within the time-out interval. The time-out interval is 6 seconds.

NOTE: The analyzer ignores violations of parity in the positive acknowledgment. An unrecognizable message will be treated as a negative acknowledgment.

The analyzer will retransmit the message if a negative acknowledgment is received from the computer within the time-out interval. One retransmission will be allowed, after which the message will be deleted from the analyzer's memory. A negative acknowledgment is the ASCII "-" (minus).

NOTE: The analyzer ignores violations of parity in the negative acknowledgment. An unrecognizable message will be treated as a negative acknowledgment.

If the acknowledgment is sent before the analyzer has completed the message transfer, the acknowledgment is ignored.

The message is framed with a message-beginning character, "!" (exclamation point), and the message-ending characters, "CR-LF" (carriage return-line feed). The characters are transmitted with the parity configured selected.

NOTE: Due to the binary data present in the service record format, a "CR-LF" may appear imbedded in the transmitted data. Serial interface communication software intended to be used with the service record format should use either the analyte or unit codes to key the record length, bytes 28-31 or byte 65 of the data record.

2.4.4 Check Sum

A check-sum value is calculated and added just prior to the end-of-message characters. The check sum is defined as follows:

1. Take the binary sum (exclusive OR) independently (without carry) on each of the seven individual levels (data bits) of the transmission code, including the message-beginning character but excluding the message-ending characters. The first character, or the beginning-message character is exclusive OR with zero.
2. The parity bit associated with the check sum is consistent with the selected parity for the message.
3. The resulting 8-bit value is converted to two hexadecimal values.
4. The parity configured is applied to each of the hexadecimal values.
5. The ASCII representations of the two hexadecimal values, with parity applied, are transmitted as the character check sum, most significant character first.

NOTE:

ACK = ! + <Checksum 1> <Checksum 2>
 <CR> <LF>

NAK = ! - <Checksum 1> <Checksum 2>
 <CR> <LF>

	TXD*	1	2	RXD (RS232 pin 3)
(RS232 pin 2)	TXD	3	4	RXD*
	RTS*	5	6	CTS*
(RS232 pin 4)	RTS	7	8	CTS (RS232 pin 5)
	DTR*	9	10	DSR (RS232 pin 6)
(RS232 pin 20)	DTR	11	12	DSR*

*Asterisked signals refer to the analyzer's internal serial interface control lines.

Figure 3. DT60 Analyzer Serial Interface Adapter Box Jumpers.

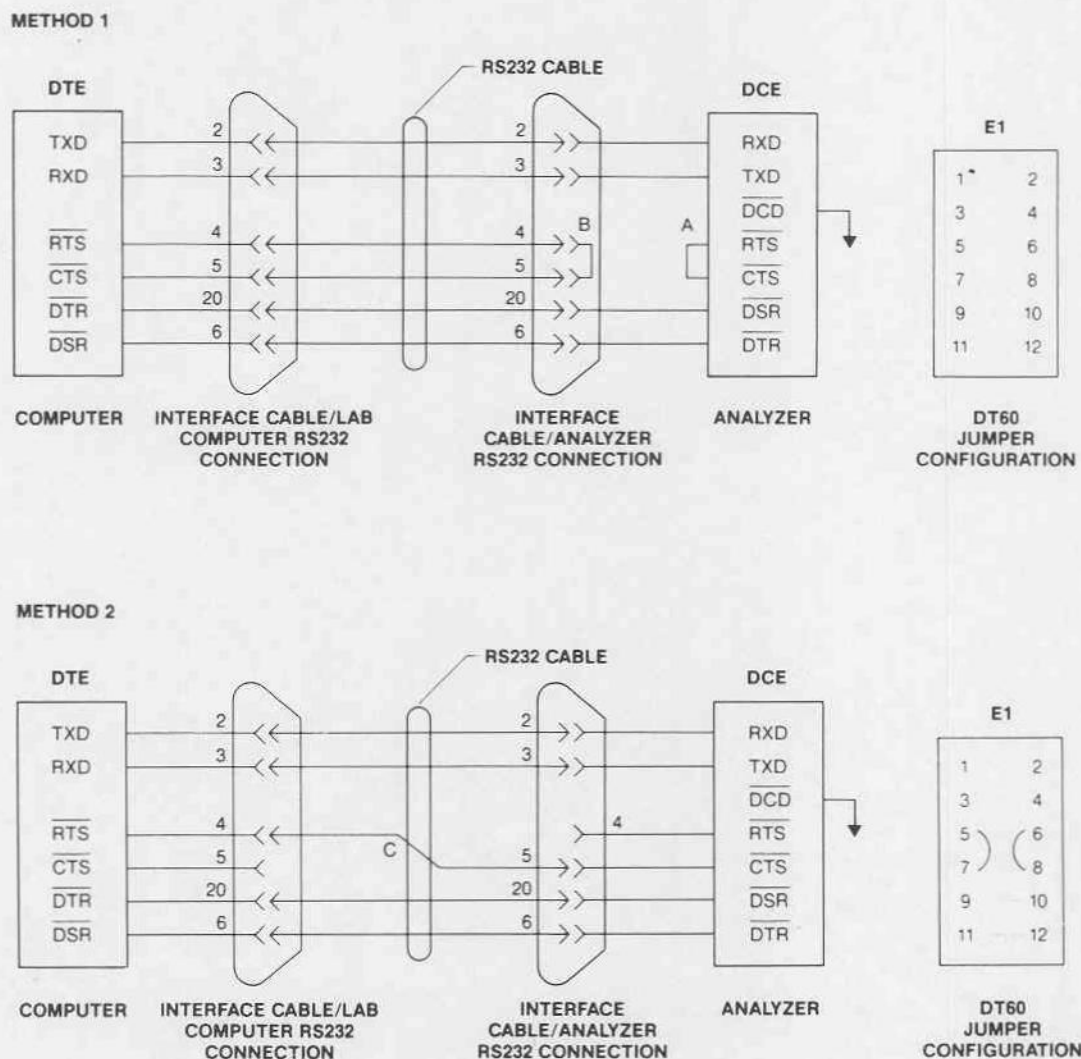


Figure 4. DT60 Analyzer as a DCE Device.

INFORMATION INTERFACE

Two types of record format are possible; the normal operating format one that the customer uses and a service format that is used by a Kodak equipment service representative. The service switch on the DT60

Driver PBC in conjunction with switch two on the analyzer's I/O PCB will be the flag that tells the system which record to output. The following table is the customer output record format.

STARTING LOCATION	NUMBER OF CHARACTERS	FIELD CONTENTS																																																				
0	1	Start character: <!>																																																				
1	1	Version number: This value is currently set at "1". The value will be changed whenever there is a change in the format of the computer interface or a significant change in the meaning of any data fields in the interface.																																																				
2	1	Record Type: The value for the operating format record is "1".																																																				
3-5	3	Sequence Number: This is a record counter which is initialized to "000" at analyzer start-up (when the main power switch is turned from "OFF" to "ON"). The sequence number is incremented by one for each message output. If, however, a negative acknowledgment or an unrecognizable message is received by the analyzer following the transmission of a record, the analyzer will retransmit the record. Hence, two identical records with the same sequence number will be received by the laboratory computer. The sequence number can be used by the laboratory computer to identify the missing records. The value of the sequence number automatically wraps around to "000" after reaching "999".																																																				
6-13	8	Date: Date that the results were reported for the specimen. The date will be printed out exactly the way it was entered (NN-NN-NN).																																																				
14-17	4	Time: Time that results were reported for the specimen.																																																				
18-27	10	Patient Identification: Prints out a patient identification number up to 10 characters (includes a decimal point or a dash).																																																				
28-31	4	<p>Analyte Code: The analyte code is chosen to be reported in a four byte ASCII string and to contain the same mnemonics as used on the slides themselves. This is considered to be a more useful descriptive than a two-digit code. The additional software burden placed on the lab computer is believed to be minimal.</p> <table><tr><th>Test Name</th><th>Report Name</th><th>Test Name</th><th>Report Name</th></tr><tr><td>Glucose</td><td>GLU</td><td>Potassium</td><td>K +</td></tr><tr><td>Urea Nitrogen</td><td>BUN</td><td>Carbon Dioxide</td><td>CO₂</td></tr><tr><td>Cholesterol</td><td>CHOL</td><td>Chloride</td><td>CL-</td></tr><tr><td>Triglycerides</td><td>TRIG</td><td>Aspartate Aminotransferase</td><td>AST</td></tr><tr><td>Uric Acid</td><td>URIC</td><td>Alanine Aminotransferase</td><td>ALT</td></tr><tr><td>Total Protein</td><td>TP</td><td>Lactate Dehydrogenase</td><td>LDH</td></tr><tr><td>Total Bilirubin</td><td>TBIL</td><td>Creatine Kinase</td><td>CK</td></tr><tr><td>Amylase</td><td>AMYL</td><td>Alkaline Phosphatase</td><td>ALKP</td></tr><tr><td>Ammonia</td><td>NH₃</td><td>Lipase</td><td>LIPA</td></tr><tr><td>Creatinine</td><td>CREA</td><td>Gamma Glutamyltransferase</td><td>GGT</td></tr><tr><td>Hemoglobin</td><td>Hb</td><td>Calcium</td><td>CA</td></tr><tr><td>Sodium</td><td>NA +</td><td></td><td></td></tr></table>	Test Name	Report Name	Test Name	Report Name	Glucose	GLU	Potassium	K +	Urea Nitrogen	BUN	Carbon Dioxide	CO ₂	Cholesterol	CHOL	Chloride	CL-	Triglycerides	TRIG	Aspartate Aminotransferase	AST	Uric Acid	URIC	Alanine Aminotransferase	ALT	Total Protein	TP	Lactate Dehydrogenase	LDH	Total Bilirubin	TBIL	Creatine Kinase	CK	Amylase	AMYL	Alkaline Phosphatase	ALKP	Ammonia	NH ₃	Lipase	LIPA	Creatinine	CREA	Gamma Glutamyltransferase	GGT	Hemoglobin	Hb	Calcium	CA	Sodium	NA +		
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Total Protein	TP	Lactate Dehydrogenase	LDH																																																			
Total Bilirubin	TBIL	Creatine Kinase	CK																																																			
Amylase	AMYL	Alkaline Phosphatase	ALKP																																																			
Ammonia	NH ₃	Lipase	LIPA																																																			
Creatinine	CREA	Gamma Glutamyltransferase	GGT																																																			
Hemoglobin	Hb	Calcium	CA																																																			
Sodium	NA +																																																					

STARTING LOCATION	NUMBER OF CHARACTERS	FIELD CONTENTS
32	1	Error Code: Error code is structured according to the following format: 0 = No error 1 = Above analyzer range. Value reported is upper limit of range. 2 = Below analyzer range. Value reported is lower limit of range. 3 = Prediction failure. 4 = Analyzer generated warning.
33	1	Undefined Field: This field contains a blank.
34-40	7	Results Reporting: This reports the concentration of the specimen.
41-46	6	Units: Reporting units are left justified.
47	1	Undefined Field: This field contains a blank.
48	1	Undefined Field: This field contains a blank.
49-59	11	Undefined Field: This field contains blanks.
60-61	2	Checksum
62-63	2	Record Terminator: End of record = <CR> <LF>



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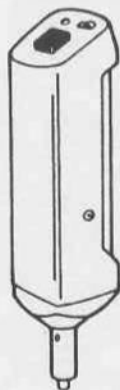
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Kodak Ektachem
DT Pipette
for use with the
Kodak Ektachem
DT System



Clinical Products Division

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1. Features of the *Kodak Ektachem* DT Pipette

The *Kodak Ektachem* DT Pipette is a state-of-the-art, precision instrument designed to deliver an accurate 10 μ L drop of fluid for in-vitro analysis. It was developed for use with both the *Kodak Ektachem* DT60 Analyzer and *Kodak Ektachem* DTSC Module, and incorporates these important features:

- automated aspiration and dispense operation for consistent sample size
- audible tones prompt the user for error-free operation
- disposable tips prevent sample contamination. Tips are available at no additional cost when you purchase *Kodak Ektachem* DT Slides.
- powered by rechargeable battery, or optional power cord
- power switch conserves power

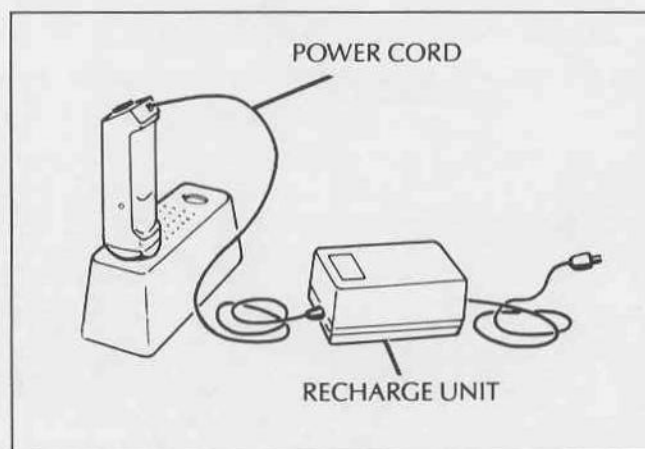
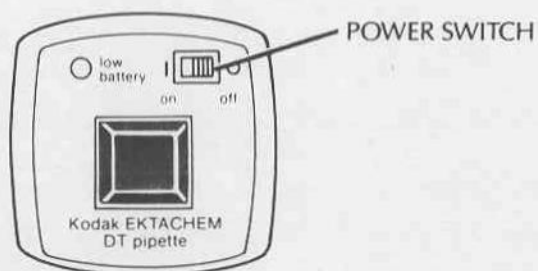
The *Kodak Ektachem* DTE Module, an instrument for electrolyte analysis, uses a separate dual-tip pipette.

This reference guide provides complete instructions for the use and care of the DT Pipette. If you have any further questions about the use of this instrument, please call Kodak's Customer Assistance Hotline for more information, at 1-800-521-0098.

2. How to Charge the Battery

The DT Pipette comes with a rechargeable battery already installed. To charge the battery for use, follow these steps:

- Move the power switch to **off**.



- Connect the power cord to the power socket on the DT Pipette.
- Plug the recharge unit into a wall outlet.
- Allow 20 hours for the battery to charge. It may require up to 24 hours to charge a fully discharged battery.

NOTE

The pipette can be used while it is charging; see Section 3 for instructions.

- Unplug the recharge unit when not in use.

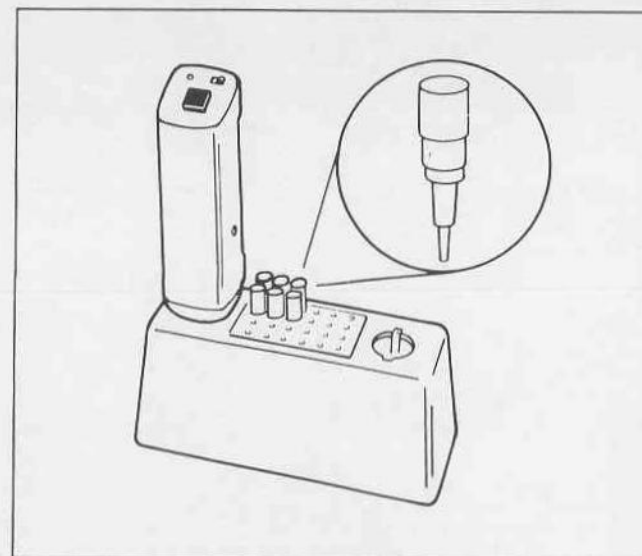
3. Using the DT Pipette with the Power Cord

It is possible to use the DT Pipette when the battery is discharged by connecting it to the recharge unit. Just follow these steps:

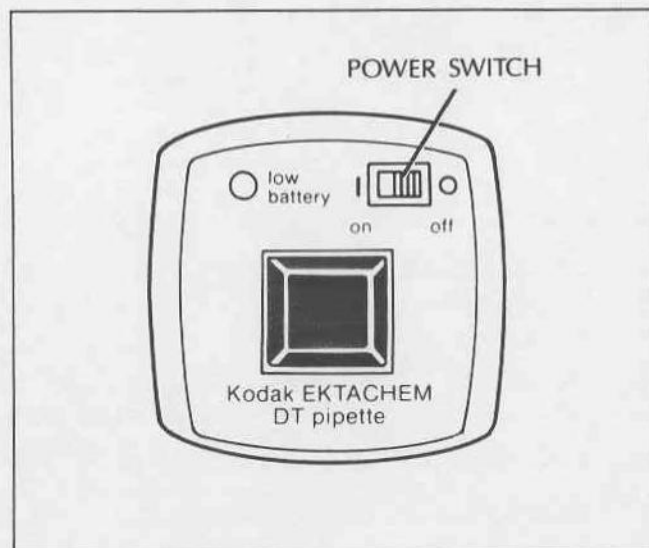
- Move the power switch to **off**.
- Connect the power cord to the power socket on the DT Pipette.
- Plug the recharge unit into a wall outlet near the DT60 Analyzer.
- Move the power switch to **on**, and wait 3 seconds while the DT Pipette resets.
- The DT Pipette is now ready for use. See Section 4, "Using the DT Pipette to Process Tests."
- When you are through using the DT Pipette, follow the procedure in Section 2, "How to Charge the Battery."

The battery will continue to recharge while the pipette is in use with the power cord.

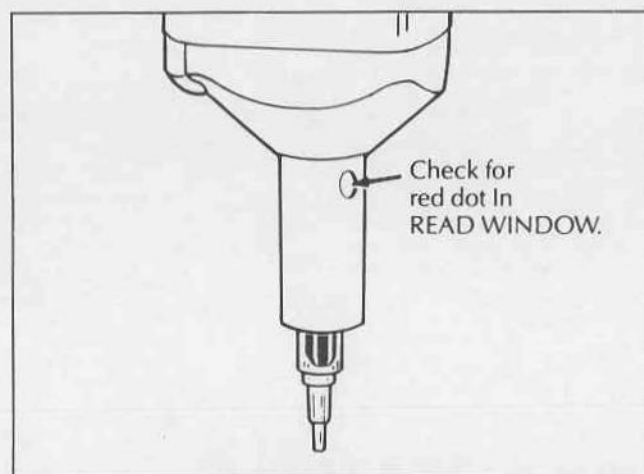
4. Using the DT Pipette to Process Tests



- Place disposable tips in the holder.



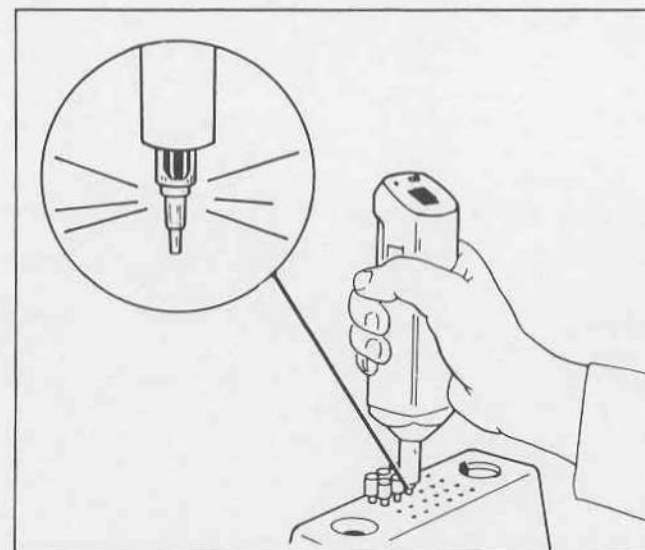
- Move the power switch on the DT Pipette to **on**.



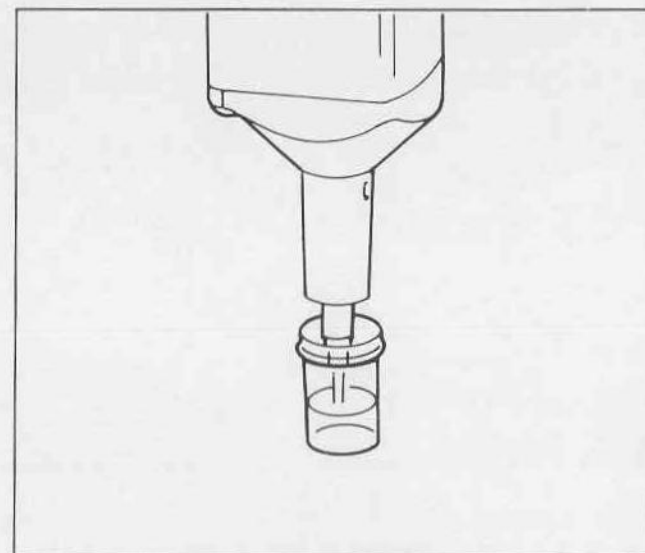
- Check the read window. The red indicator dot shows that the DT Pipette is ready for operation.

NOTE

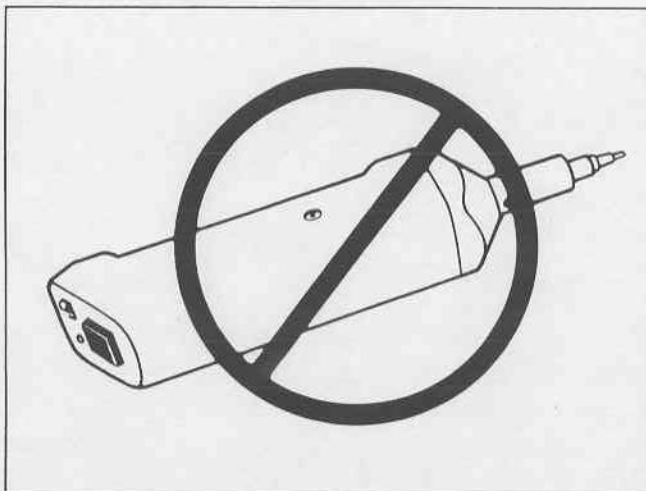
If the red dot is not visible, see Section 8, "Troubleshooting."



- To attach a disposable tip, press the DT Pipette into one of the tips in the holder. The tip will click into place when it is seated correctly.

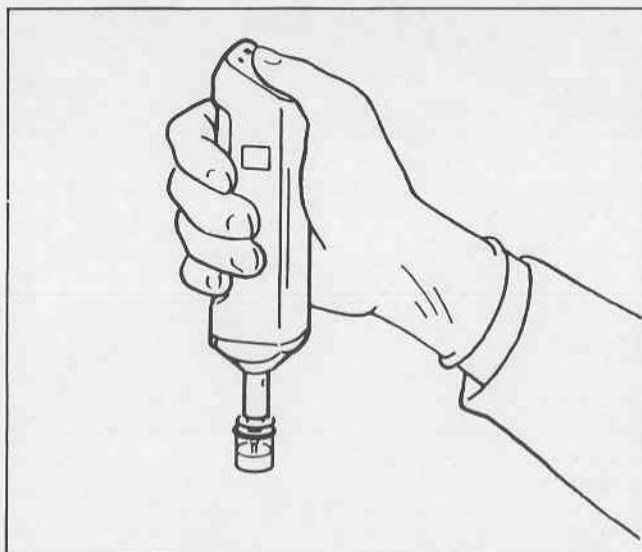


- Insert the tip into the fluid, but not to the bottom of the fluid container.

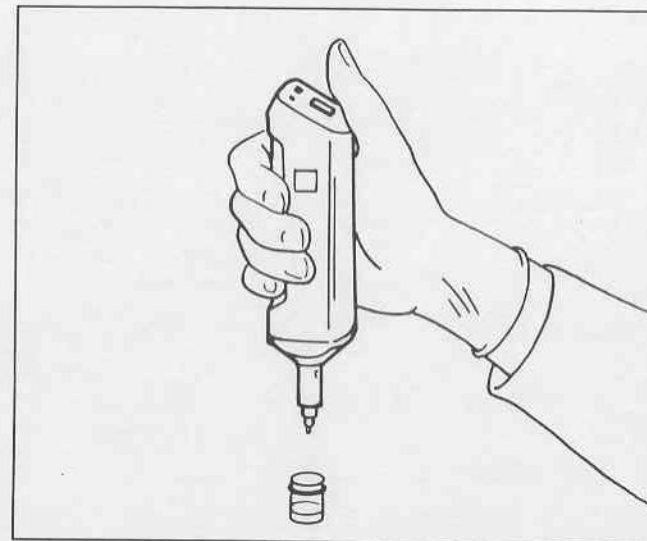


NOTE

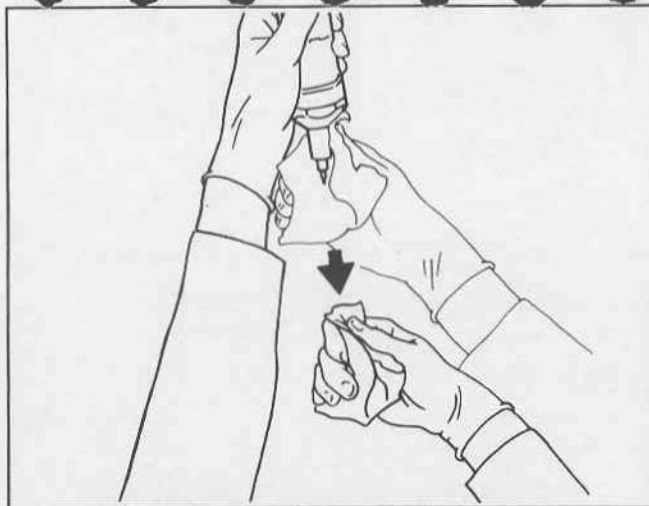
Always hold the DT Pipette vertically whenever there is fluid in the tip. If you tilt the DT Pipette or lay it on its side, fluid might enter the mechanism, causing it to become clogged. If this does occur, clean the DT Pipette immediately. See Section 5, "Cleaning the DT Pipette".



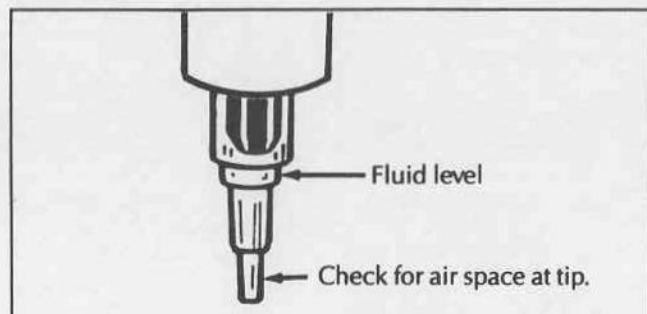
6 • Press the button to aspirate fluid.



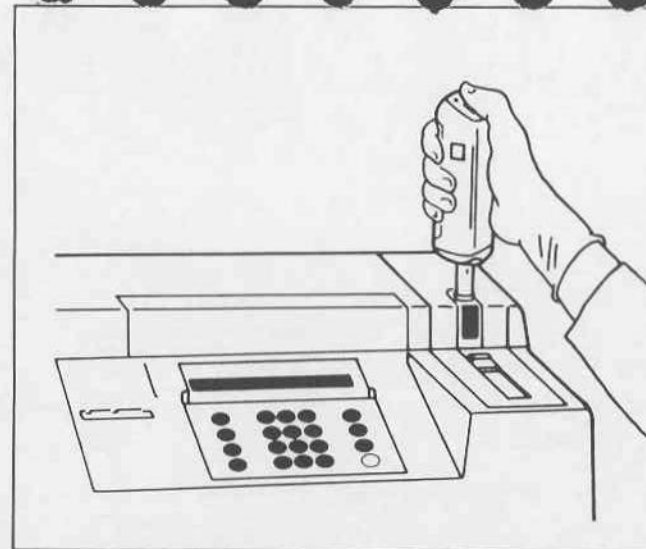
- A beep will be heard, which is the signal to withdraw the DT Pipette. Remove the DT Pipette from the fluid immediately.
- A second beep will be heard. This indicates that the DT Pipette is drawing the fluid further into the tip, to prevent accidental loss of fluid. **If the pipette is not removed from the fluid before the second beep, too much fluid will be aspirated.**



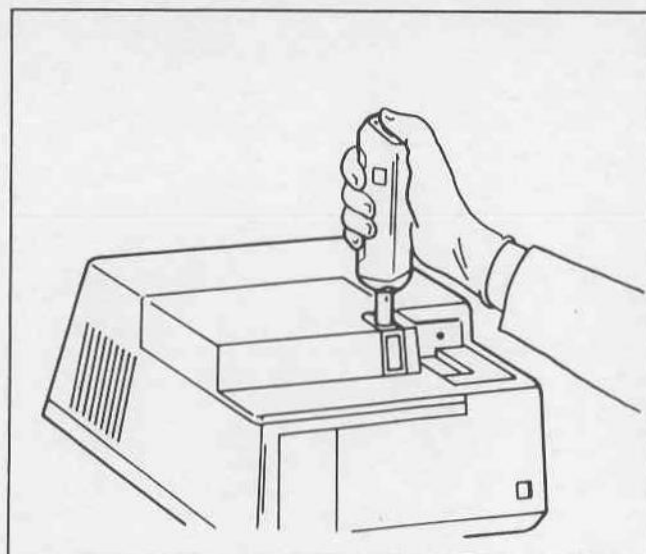
- To remove any droplets which may be clinging to the outside of the tip, take a laboratory tissue and wipe the outside of the tip in a light, quick motion. **If the tip is not wiped, test results might not be accurate.**



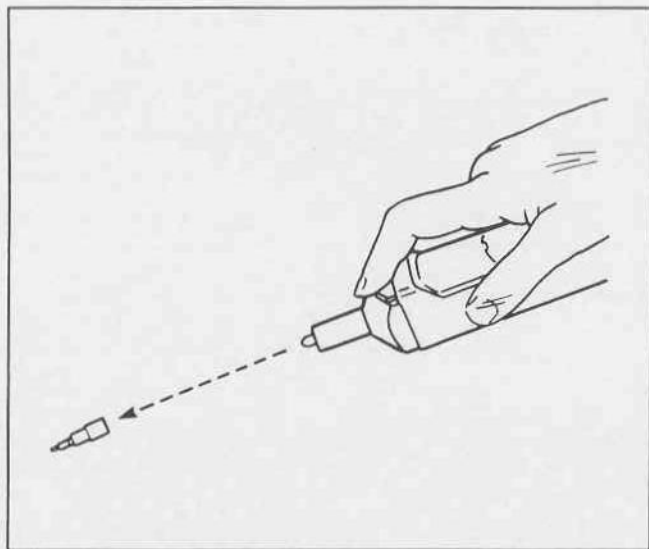
- Check that the fluid level in the tip is approximately as shown in the illustration. Also check for an air space in the bottom of the tip. If the fluid levels are not approximately as shown, press the button to dispense the sample into a tissue, eject the tip, and repeat the above procedure.



- Gently insert the DT Pipette into the pipette locator in the *DT60 Analyzer* or *DTSC Module*. The pipette must be fully seated in the pipette locator.
- Press the button to dispense the fluid.
- At the beep, remove the DT Pipette within one second from the pipette locator.



- Check that the fluid was completely dispensed from the tip. If fluid is still visible, press the button to dispense the fluid into a tissue.
- Press the latch button to eject the used tip.

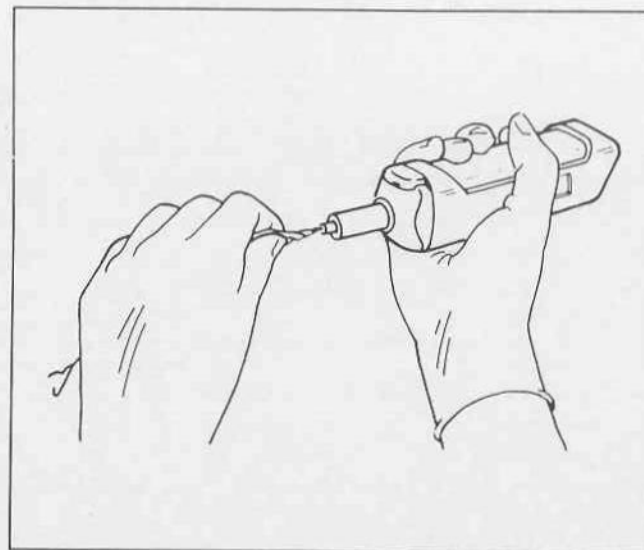


NOTE

- Tips may be used only once. Always use a new tip for each aspiration, even if it is drawn from the same fluid.
- To prevent fluid from entering the mechanism, never eject a tip that has fluid in it. Always dispense the fluid completely before ejecting the tip.
- Turn the power switch to **off** if the DT Pipette will not be used within an hour. If the switch is left on, the DT Pipette will continue to draw power from the battery even when it is not in operation.

5. Cleaning the DT Pipette

Daily Cleaning: Wipe the metal end of the DT Pipette with an absorbent clean cloth to prevent serum buildup.



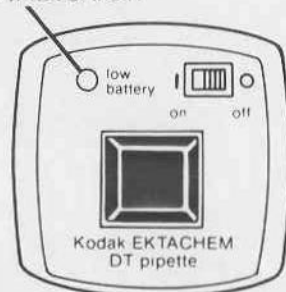
If fluid enters the mechanism: If fluid has been accidentally introduced into the metal end of the DT Pipette, it can dry and damage the mechanism. Do the following procedure immediately:

- Press the latch button to eject the tip.
- Dampen a laboratory tissue with distilled or deionized water and taper the end to a point.
- Use a twisting motion to insert the tissue into the metal end to remove the fluid.
- Use another tissue to dry the DT Pipette thoroughly.

6. When to Recharge the Battery

When the battery power becomes low and the battery is ready for recharging, you will hear four beeps and see the **low battery** indicator lit when the DT Pipette is in use. **For maximum battery life, do not recharge the battery before these indications occur.** To charge the battery, see Section 2, "How to Charge the Battery."

LOW BATTERY INDICATOR



7. Battery Replacement

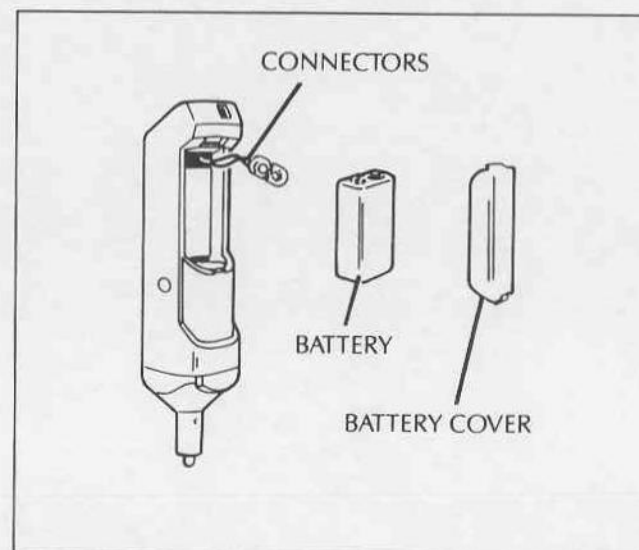
Rechargeable batteries may eventually need replacement, as their capacity to store power is reduced. Kodak supplies one Sanyo brand 9-volt, 120 mA/hr rechargeable battery installed in the DT Pipette, and for optimal results recommends this battery as a replacement. If a substitution must be made, use 9-volt nickel-cadmium rechargeable batteries to ensure good performance. 9-volt alkaline batteries may also be used in operation only, but battery life will be reduced. *Do not attempt to recharge alkaline batteries.*

WARNING

Charge only nickel-cadmium rechargeable batteries. Other types of batteries such as alkaline batteries may leak, overheat, or explode, causing damage to the DT Pipette and personal injury.

To install a new battery, follow this procedure:

- Move the power switch to **off**.
- Use a coin to pry off the battery cover.
- Tilt the DT Pipette and allow the battery to drop into your hand. Do not pull on the wires.
- Unsnap the battery from the connectors.
- Snap the new battery into the connectors.
- Put the battery into the battery compartment.
- Replace the battery cover.
- Charge the battery; see Section 2.



8. Troubleshooting

If this malfunction occurs...	...try these solutions:
The red dot is not visible in the read window.	<ul style="list-style-type: none">• Move the power switch to off and then to on again. The pipette mechanism will reset. Check for the red dot again.• If the red dot still is not visible, try recharging the battery, or operate with the power cord.• Clean the pipette. See Section 5.• If the red dot is still not visible, call Kodak's Customer Assistance Hotline, 1-800-521-0098.
Fluid leaks from the tip	<ul style="list-style-type: none">• Try a new tip.• Check that the tip is firmly sealed.• Check that the fluid is at room temperature.• If the condition persists, call Kodak's Customer Assistance Hotline, 1-800-521-0098.
The pipette beeps 4 times and the battery low indicator lights up.	<ul style="list-style-type: none">• Recharge the battery.

Kodak, Ektachem, DT60, DTE, and DTSC are trademarks.

Clinical Products Division

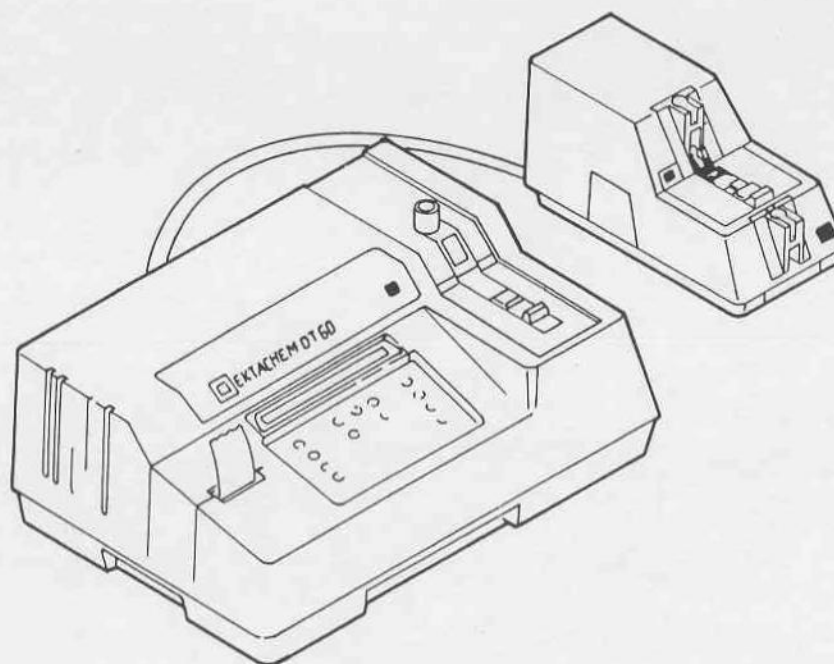


Part No. 352903
6/88

Printed in U.S.A.



Service Publication for the *Kodak Ektachem DT60* ANALYZER and the *Kodak Ektachem DTE* MODULE



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CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.



Publication No. XP3100-1
8/88
Supersedes XP3100-1, 11/87
or 2/88

Kodak Ektachem DT60 ANALYZER *Kodak Ektachem DTE MODULE*

General Information Section 1

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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**Service Publication for the
Kodak Ektachem DT60 ANALYZER
and the
Kodak Ektachem DTE MODULE**

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For U.S. and Canada - PK3100
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NOTE:

PRODUCT SUPPORT PARTS LIST
DISTRICT

Kodak Ektachem DT60 Analyzer
Service Code 3100

Part Number	Description	Suggested Stocking Quantity	Unit Price	Disposition
352606	Lower Arm Sub Assembly	1	\$ 1.75	use to depletion
343878 D	Thermistor Assembly	0	43.00	
343881	Heater Rod Assembly	1	62.00	
352415	Guard - Printer	1	5.00	
350246	Bar Code Reader Assembly	1	80.00	
352479	Pipette Locator Housing, Cover & Screws	1	28.00	
352399 D	PCB - GDM/BLM w/ Hazaree	0	91.00	use to depletion
352696 N	FORS Weight Assembly	1	267.00	use 352384 to depl.
352397 D	Shroud - AV - FORS - Weight	0	3.50	use to depletion
352543 N	Lower Rack Assembly	1	134.00	use 352434 to depl.
352487	PCB - CPU V11.0 w/Proms	1	486.00 (E)	
352520	PCB - I/O V10.7 w/Proms	1	946.00	
352387	PCB - Driver	1	455.00	
613907	Rack/Pusher Finger Assembly	1	4.50	
613908	Motor/Pinion Assembly	1	175.00	
352473	FORS Head with Circuit Board	1	934.00	
352695	PCB/Printer Interface	1	151.00	
613960	Printer Assembly	1	120.00	
613971	Breaker Sub Assembly	1	70.00	
✓ 352754 N	Power Supply Assembly	①	421.00	use 616818 to depl.
352655	Master Bd. (S8DT)	1	795.00	

N : new part number
D : delete from product support list

PRODUCT SUPPORT PARTS LIST
FIELD ENGINEER

Kodak Ektachem DT60 Analyzer
Service Code 3100

Part Number	Description	Suggested Stocking Quantity	Unit Price	Disposition
157529 D	O-Ring	0	\$.50	use to depletion
132927	Fuse - 3 AMP Power Supply	5	.60	
343879	Switch - Cover Open	2	36.00	
343882	Sensor - Spot Detector	2	39.00	
350204	Spring - Overshoot	5	1.00	
✓ 350247	Sensor - Home/Slide ①	5	21.00	
535644	Pin - Dowel	5	\$.50	
613882	Pivot - Screw	5	10.50	

N : new part number
D : delete from product support list

PRODUCT SUPPORT PARTS LIST
DISTRICT
Kodak Ektachem DTE Analyzer
Service Code 3110

<u>Part Number</u>	<u>Description</u>	<u>Suggested Stocking Quantity</u>	<u>Unit Price</u>	<u>Disposition</u>
350248	Bar Code Reader	1	\$ \$84.00	
617151	Interface PCB Assembly	1	259.00	
617152	Linear Actuator Assembly	1	107.00	
352751	Electrometer Kit Assembly	1	559.00	Use 352649 to depl.
617154	Magnetic Switch Assembly	1	9.50	

N: new part number
D: delete from Product Support List

PRODUCT SUPPORT PARTS LIST
FIELD ENGINEER
Kodak Ektachem DTE Analyzer
Service Code 3110

<u>Part Number</u>	<u>Description</u>	<u>Suggested Stocking Quantity</u>	<u>Unit Price</u>	<u>Disposition</u>
350249	Sensor Assembly - Home Position	5	\$ 17.00	
617157	D LEE Assembly- - - - -	0	9.50	use to depletion
618252	Window - Glass (BCR)	1	.50	
618265	Spring (Right Hand)	2	4.50	
618266	Spring (Left Hand)	2	4.50	
352744	Boot - Incubation	1	14.00	
618301	D Gable Clamp	0	2.00	

N : new part number
D : delete from Product Support List

PRODUCT SUPPORT PARTS LIST

DISTRICT

Kodak Ektachem DTSC Analyzer
Service Code 3111

Part Number	Description	Suggested Stocking Quantity	Unit Price	Disposition
351789	Flash Lamp	2	\$ 297.00	
337444	IC-Analog PCB	1	9.50	
351441 D	Slider-Gam-	1	1.25	use to depletion
351449 D	Jumper-Gable-	0	11.50	use to depletion
351458	Cover-Flash Lamp	0	2.00	
352391	Analog PCB Ay	2	1624.00	
✓ 351463	Bar Code Reader PCB Ay	(1)	144.00	
✓ 351464	Hall Effect Sensor PCB	(1)	67.00	
✓ 351474	Belt Slide Transport (2)	1	5.50	
351678	Read Arm/Heater Ay	2	155.00	
351679	Pre-Heat Arm/Heater Ay	2	117.00	
352666	Monitor/Pinion Ay	1	64.00	
351746 D	Slide-Stop-	0	7.00	use to depletion
352796 N	Controller PCB	2	\$ 733.00	Return 352498 to Parts Services for rework
	✓ (FROM 351807 shipped w/PCB) (1)			
351717 D	Pre-Heat-Platen-		\$ 199.00	use to depletion
351788 A	Reflectometer Assy	1		Addition

N : new part number
D : delete from Product Support List
A : addition to Product Support List

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PRODUCT SUPPORT PARTS LIST

FIELD ENGINEER

Kodak Ektachem DTSC Analyzer
Service Code 3111

Part Number	Description	Suggested Stocking Quantity	Unit Price	Disposition
131075	Ring-Retainer	5	\$.05	
144649	Nut-Tinnermen Clip	5	.10	
✓ 152776 (US)	Fuse-3/4 Amp 120 Vac (3)	5	1.00	
337468 (IPO)	Fuse - 220V IPO	5	3.00	
✓ 337396	Fuse-Flash Ay (3)	5	2.50	
✓ 337488	Fuse 2.5 Amp Micro PCB (3)	5	1.00	
✓ 337490	Fuse 250 MA Micro PCB (3)	5	1.00	
✓ 351492	Spot Detector Sensor Ay (1)		37.00	
351720	Clip-Slide Transport	2	5.00	

N : new part number
D : delete from Product Support List

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PRODUCT SUPPORT PARTS LIST
FIELD ENGINEER TOOLS
Kodak Ektachem DT60/DTE/DTSC Analyzers
Service Codes 3100/3110/3111

<u>Part Number</u>	<u>Description</u>	<u>Suggested Stocking Quantity</u>	<u>Unit Price</u>
2598TL	Fluke Temp. Probe	1	\$ 210.00
3340TL	FORS Adj. Board	1	61.00
3344TL	White Reference Slide (25)	1	57.00
3345TL	Black Reference Slide (25)	1	57.00
3482TL	Bar Code Reader Slide (2/pack)	1	5.00
3446TL	Tip Height Gauge	1	82.00
3773TL	Contact Lubricant	1	
3889TL	Thermal Paper	1	

DTSC TOOLS

3577TL	Test Point Board	1	36.00
3575TL	White Reference Slide (25)	1	24.50
3576TL	Black Reference Slide (25)	1	24.50
3580TL	Lamp Removal Tool	1	.85
3624TL	Ribbon Cable	1	21.50
3606TL	Dual Socket Adapter	1	20.00

COMMON TOOLS USED ON DT60/DTE/DTSC

2192TL	Heat Sink Compound	1	\$ 4.50
2390TL	Sealant	1	6.00
2425TL	Vibratite	1	10.50
3190TL	Grounding Kit	1	68.00
3424TL	Digital Volt Meter	1	370.00
1607TL	Hex Wrench Set	1	17.50
1079TL	Spring Scale	1	26.00
3225TL	Loop Back Connector	1	9.50
3008TL	Logic Pen	1	144.00

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XP3100-1

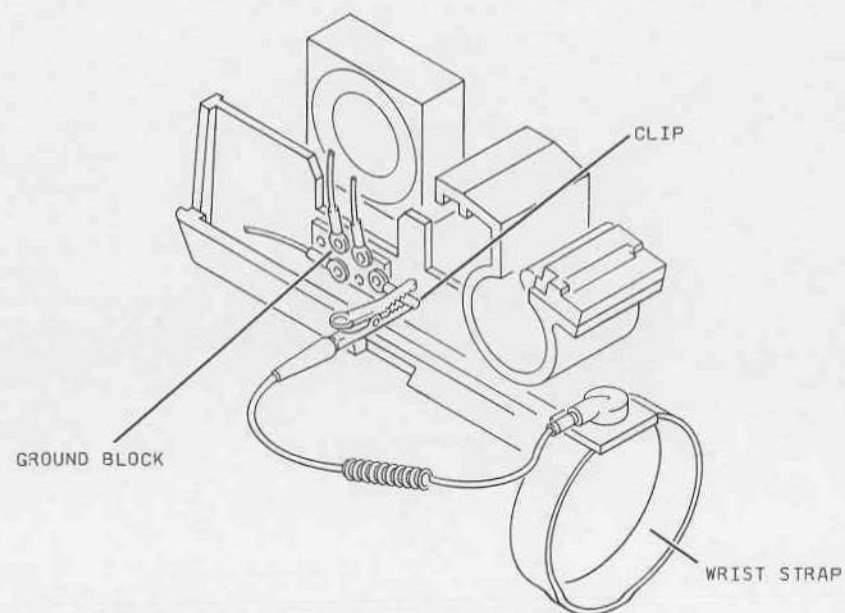
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ESD Procedure

This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Use the ANTISTATIC GROUNDING KIT TL-3190 to protect sensitive components from electrostatic discharge. Connect the ANTISTATIC WRIST STRAP to the spare CLIP attached to the GROUND BLOCK



General Information
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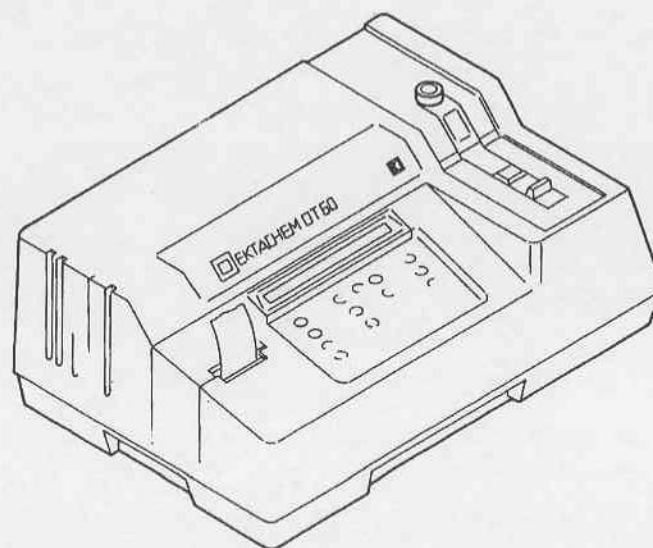
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Publication No. XP3100-35
4/90
Supersedes XP3100-35
1/88

Normal Operation
for the
Kodak Ektachem DT60 ANALYZER
Section 2



E003_000008

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CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Initialization

Function

During the initialization sequence, the computer executes 4 functions:

- Through the PRINTER INTERFACE BOARD, a mechanical checkout of the PRINTER
- A checkout of the electronic components
- Operation of the mechanical parts to clear 1 to 6 slides from the INCUBATOR
- Initialization of the Temperature Control and Monitoring Circuit until the temperature of the INCUBATOR reaches the set point.

Initialization occurs automatically when the MAIN POWER SWITCH is moved from the "O" position to the "I" position.

Description

PRINTER - Mechanical Checkout

When power is applied to the DT60 ANALYZER, the microprocessor on the PRINTER INTERFACE BOARD operates first. That microprocessor executes internal checkouts for the PRINTER INTERFACE BOARD, then sends a command signal to actuate the PRINTER MOTOR for 1 cycle. If the initialization operates normally, the PRINT HEAD moves from the home-position to the opposite side of the paper tape and returns to the home-position within 4 seconds, without printing any characters. Then the PRINTER MOTOR and the PRINT HEAD are actuated to print 3 lines of all possible characters. The PRINT HEAD returns to, and remains in, the home-position.

Service personnel can observe the PRINT HEAD during the initialization to determine if the PRINTER, the PRINTER INTERFACE BOARD, or the corresponding circuit has any malfunction.

NOTE

If the PRINT HEAD does not move and Error Code F18 occurs, check the PRINTER for a malfunction. If the PRINT HEAD does not move and Error Code F18 does not occur, check the PRINTER INTERFACE BOARD or the circuit for a malfunction.

Checkout of the Electronic Components

After the mechanical checkout of the PRINTER is completed successfully, the microprocessor on the CPU BOARD in Multi-Board units, or on the MASTER BOARD in Single-Board units, executes electronic checkouts of:

- the internal ROM components
- the external ROM, or the CALIBRATION DATA MODULE and the CHEMISTRY LANGUAGE MODULE
- the NON-VOLATILE RAM

These checkouts are completed within approximately 4 seconds. If the electronic components provide the expected results, the microprocessor executes a command signal to the PRINTER INTERFACE BOARD to

actuate the PRINTER MOTOR. The PRINTER prints the message "SELF TEST OK" on the printout. Then the PRINTER prints 1 line of 19 "*" characters. The following message is displayed on the LC DISPLAY:

COPYRIGHT EASTMAN KODAK CO.
ALL RIGHTS RESERVED, 1986

WAIT

NOTE

The "WAIT" message flashes and continues to flash until the full initialization is completed.

The PRINTER prints an additional line of 19 "*" characters. When these messages are displayed, and the "*" characters are printed, the electronic checkout function of the initialization is completed successfully. If the electronic checkout function does not complete successfully, a "D" error code should occur, and the initialization stops. For additional information, see the descriptions of the "D" error codes in Diagnostics, section 5 of this service manual.

Operation of the Mechanical Components

After the electronic checkout is completed successfully, the microprocessor on the CPU BOARD in Multi-Board units, or on the MASTER BOARD in Single-Board units, executes a command signal to operate the MOTOR AND PINION ASSEMBLY and the Slide Transport System for 6 full cycles. When the mechanical operation function of the initialization is completed, the PRINTER prints the message "EMPTY SLIDE DISPOSAL BOX".

NOTE

All slides are discarded into the SLIDE DISPOSAL BOX during the mechanical operation unless 6 slides were in the INCUBATOR when the initialization started. If 6 slides were in the INCUBATOR, one slide remains in the READ STATION when initialization is completed. That remaining slide is discarded when the first slide is processed.

If the mechanical operation does not complete successfully, an "F" error code might occur. For additional information, see the descriptions for Error Codes F12 to F14, and Error Codes F15, F16, and F19 in Diagnostics, section 5 of this service manual.

Initialization of the Temperature Control and Monitoring Circuit

When the DT60 ANALYZER is first energized, the Temperature Control and Monitoring Circuit starts to heat the INCUBATOR. In Multi-Board units, the FAN also starts to operate when the ANALYZER is first energized. In Single-Board units, the FAN is actuated when the temperature in the INCUBATOR is within 0.9° C (0.5° F) of the set point.

The computer does not allow slide processing until the temperature in the INCUBATOR reaches the set point. The software allows a maximum time of 45 minutes for the temperature to reach the set point. When the correct temperature is reached, the message "ANALYZER READY" is displayed on the LC DISPLAY.

NOTE

If the site temperature and relative humidity are within the operating specifications for the equipment, the temperature in the INCUBATOR reaches the set point in approximately 15 to 25 minutes.

Initialization of the Temperature Control and Monitoring Circuit - Continued

If the temperature in the INCUBATOR does not reach the set point within the expected time, an Error Code H12, H13, or H14 might occur. For additional information, see the descriptions of the Error Codes H12, H13, and H14 in Diagnostics, section 5 of this service manual.

Sequence of Operation

Service personnel can observe the following actions when the MAIN POWER SWITCH is closed, or moved to the "I" position:

- [1] In Multi-Board units only, the FAN actuates immediately when the MAIN POWER SWITCH is pressed to the "I" position.
- [2]
 - The PRINTER MOTOR makes a sound when the PRINT HEAD moves through 1 cycle.
 - The top row of character positions in the LC DISPLAY goes black for approximately 1 second. Then the bottom row goes black and remains black for approximately 2 seconds.
- [3] The PRINTER makes a printout of all possible characters on 3 lines.
- [4] After the last character is printed, the PRINT HEAD returns to the home position, the DT60 ANALYZER does internal computer checkouts for approximately 4 seconds. When the internal checkouts are completed, the PRINTER prints the message "SELF TEST OK" on the printout.
- [5] Next, the PRINTER prints 1 row of 19 "*" characters, followed by the Kodak copyright:

COPYRIGHT EASTMAN
KODAK COMPANY
1986
- [6] The copyright message is displayed in the LC DISPLAY.
- [7] Next, the message "ANALYZER INITIALIZATION" is displayed in the LC DISPLAY.
- [8]
 - The "WAIT" message flashes continually in the upper right corner of the LC DISPLAY, and
 - The RACKS make a sound when they move through 6 cycles of the Slide Transport System to clear the INCUBATOR.
- [9] When the MOTOR AND PINION ASSEMBLY stops, the PRINTER prints an additional line of * characters and the message "EMPTY SLIDE DISPOSAL BOX".
- [10] The message "INCUBATOR WARMING UP" is displayed in the LC DISPLAY with the flashing "WAIT". If the DTE MODULE is attached, the message "DTE MODULE READY" is also displayed on the second line below "INCUBATOR WARMING UP". If the DTSC MODULE is attached, the message "DTSC MODULE READY" is also displayed on the second line below "WAIT".

NOTE

Steps 1 - 10 are completed in approximately 5 minutes.

- [11] In Single-Board units, the FAN is actuated when the INCUBATOR temperature is within 0.9° C (0.5° F) of the set point for the INCUBATOR temperature. For additional information, see Error Codes H12, H13, and H14 in Diagnostics, section 5 in this service manual.
- [12] When the temperature reaches the set point, the message "ANALYZER READY" is displayed in the LC DISPLAY.

Slide Identification System

Function

The Slide Identification System detects that a slide is inserted into the ANALYZER, and sends a signal to the computer that starts the operation sequence. When the slide is detected, the computer expects to receive an additional signal from the BAR CODE READER as the BAR CODE is scanned. The Slide Identification System decodes the information in the BAR CODE on the slide, and transfers the information to the computer. The data are compared with the data from the CLM, to determine if the slide is an acceptable chemistry. The slide data are also compared with data from the CDM and the NON-VOLATILE RAM to determine if the chemistry is calibrated for the generation of the slide lot.

Components

BAR CODES

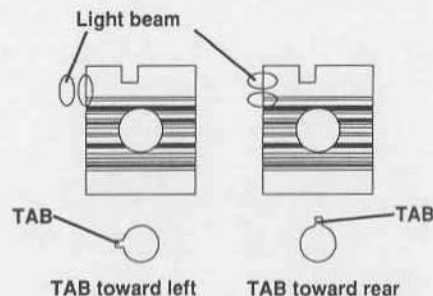
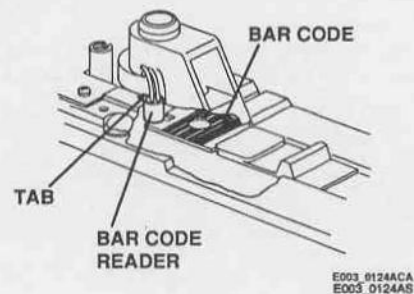
Kodak Ektachem CLINICAL CHEMISTRY SLIDES have BAR CODES, a sequence of black and white lines that can be decoded to determine the chemistry name of the slide and the generation number of the emulsion. The BAR CODE is located on the top surface of the colorimetric slides.

BAR CODE READER

The BAR CODE READER has:

- an LED (LIGHT EMITTING DIODE) that projects 2 beams of light
- a PHOTODIODE that receives the light reflected from the BAR CODE on the slide.

The shape of each light beam is oval. See the figure on the right. The position of the BAR CODE READER causes the beam that reads the slide to be long or short. To determine the position of the beams, observe the energized BAR CODE READER, or check the position of the TAB on the top of the BAR CODE READER. In some older DT60 ANALYZERS, the position of the TAB is toward the left. This position causes the length of the light beams to be perpendicular to the lines in the BAR CODE on the slide. In newer ANALYZERS, the position of the TAB is toward the rear, causing the beams to be parallel to the lines in the BAR CODE.

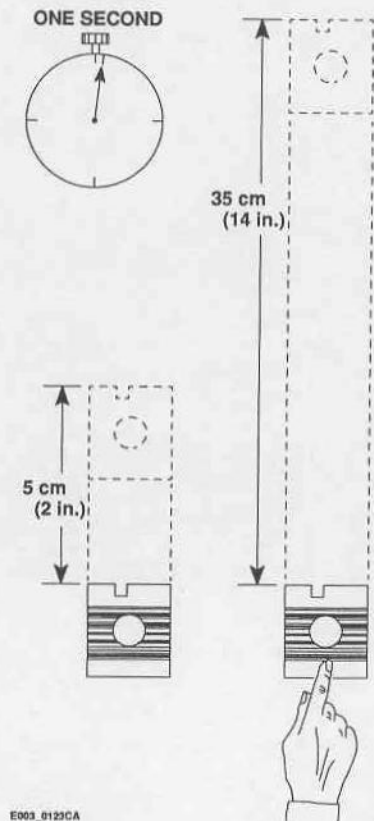


The BAR CODE READER can operate correctly in either position, but the voltage adjustment specifications are different for each position. If the TAB is toward the left, the voltage specification is -5.25 to -5.75 V dc. If the TAB is toward the rear, the voltage specification is -4.25 to -4.75 V dc.

Both the focus and the voltage of the BAR CODE READER can be adjusted. In the adjustment procedure, you should avoid changing the focus if the voltage is correct and the BAR CODE READER can read slides inserted at speeds of 2 to 14 in. per second. If adjustment of the focus is necessary, move the TAB to the rear, because this position can improve the operation of the BAR CODE READER.

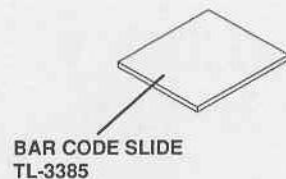
The BAR CODE READER reads the slide when the operator inserts the slide manually with the SLIDE ADVANCE LEVER. The BAR CODE READER should be able to operate within normal insertion speeds, from 5 cm (2 in.) per second to 35 cm (14 in.) per second. Because this is a manual operation, exact measurement of the insertion speed is difficult.

To estimate the slow insertion speed, measure 5 cm on a surface. Manually push a slide across that distance surface and count 1 second. To estimate the fast insertion speed, measure 35 cm and do the same procedure.



BAR CODE SLIDE TL-3385

This slide is a special tool used for adjusting the BAR CODE READER. It has no BAR CODE, and the white reflective surface provides a uniform white area that can be used to set the gain for the voltage signal within the adjustment specification. The other side of the slide is black, and is also used in the adjustment of the BAR CODE READER for Single-Board configuration.



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E003_0252AA

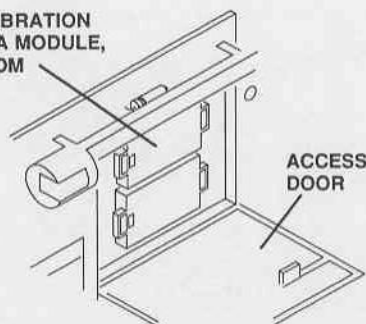
CDM

The CALIBRATION DATA MODULE, or CDM, has data that is necessary to process the tests. When the BAR CODE READER first reads the BAR CODE, the system checks the data in the CDM to determine if test data exists for the generation no. of the inserted slide. If no corresponding data exists in the CDM, the slide cannot be processed. Error messages will instruct the operator to remove the slide. For additional information about the CDM, see "Operating Instructions," section 2 in the Operator's Manual.

NOTE

To locate the CDM, open the ACCESS DOOR on the back of the DT60 ANALYZER.

CALIBRATION
DATA MODULE,
or CDM

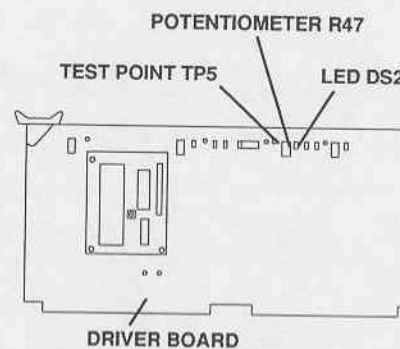


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E003_0076AA

DRIVER BOARD

In the Multi-Board Configuration, the following components on the DRIVER BOARD relate to slide identification:

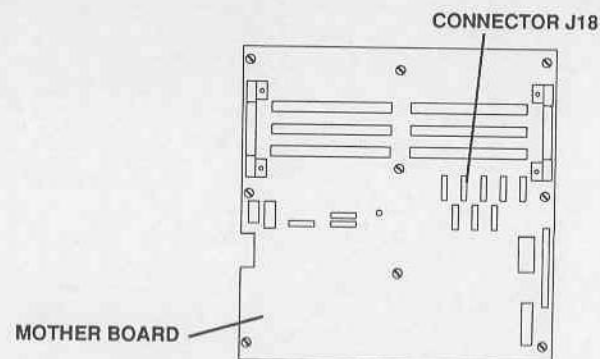
- LED DS2 - flickers when the BAR CODE READER transmits a signal from the BAR CODE.
- POTENTIOMETER R47 - sets the gain for the signal from the BAR CODE.
- TEST POINT TP5 - provides a monitoring location for the voltage signal from the BAR CODE READER.



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E003_0038BC

MOTHER BOARD

On the MOTHER BOARD in the Multi-Board Configuration, CONNECTOR J18 provides power and data communication for the BAR CODE READER.

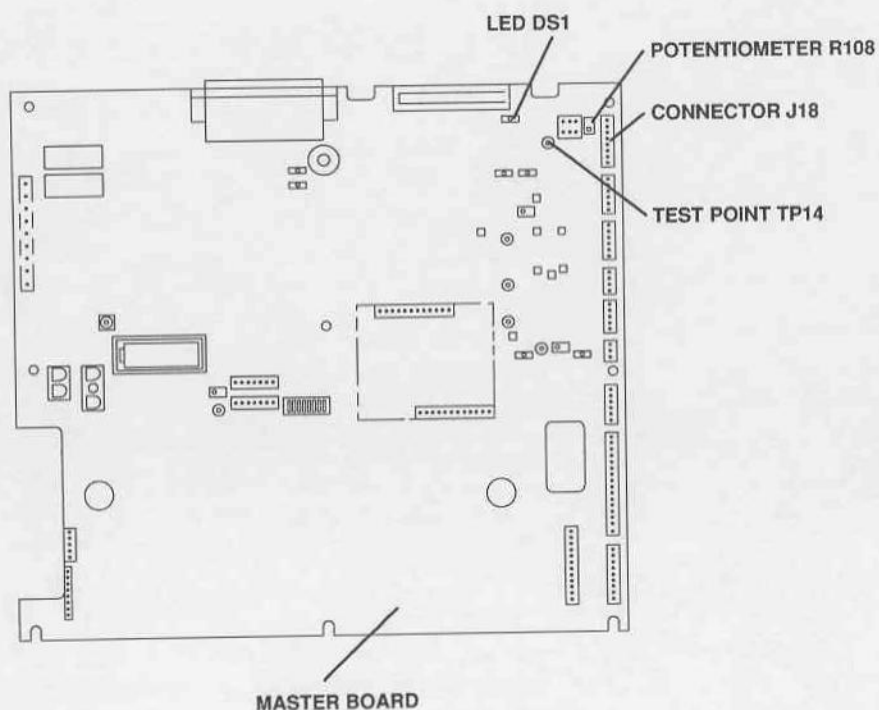


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E003_0041BC

MASTER BOARD

In the Single-Board Configuration, some components of the MASTER BOARD relate to the Slide Identification System:

- CONNECTOR J18 - provides power and data communication for the BAR CODE READER.
- LED DS1 - flickers when the BAR CODE READER transmits a signal.
- POTENTIOMETER R108 - sets the gain for the signal from the BAR CODE.
- TEST POINT TP14 - provides a monitoring location for the voltage signal from the BAR CODE READER.



E003_0113DCH
E003_0113DC

Sequence of Operation

- [1] The operator inserts the slide manually, using the SLIDE ADVANCE LEVER.
- [2] As an inserted slide moves to the SPOTTING STATION, the light beam from the BAR CODE READER scans the BAR CODE on the slide.
- [3] Some of the light is reflected from the slide up to the BAR CODE READER.
- [4] The BAR CODE READER then transmits a voltage signal corresponding to the amount of light reflected from the black and white lines in the BAR CODE.
- [5] The software decodes the signal to obtain the chemistry name and the generation No. of the inserted slide.
- [6] The data from the BAR CODE is compared with the data available from the software. In the processing mode, the chemistry data is compared with the data in the CLM, and the generation No. is compared with the data in the NON-VOLATILE RAM. In the calibration mode, the chemistry data from the slide is compared with the data in the CLM and the generation No. is compared with the data in the CDM.
- [7] If the comparison of data is successful, the message "SPOT SLIDE WITH FLUID" is displayed in the LC DISPLAY.
- [8] If the slide cannot be fully identified, but the system reads the first 3 lines in the BAR CODE, the message "SLIDE NOT IDENTIFIED/SELECT TEST" is displayed. The operator must press until the correct test name is displayed with "ENTER SLIDE GENERATION", then press to identify that chemistry.
- [9] Enter the correct numbers for the generation.
- [10] If the BAR CODE READER cannot read any lines in the BAR CODE, the message "REMOVE CM SLIDE" is displayed. The operator must lift the PIPETTE LOCATOR and remove the slide.

The following conditions can prevent a slide from being identified:

- A slide was inserted in the wrong position.
- The insertion motion was not smooth.
- The BAR CODE READER has a malfunction.

If the CDM does not have data for the inserted slide, a "C" error code will occur.

Metering System

Function

The Metering System includes all the parts and functions that provide an accurate 10 mL drop of fluid on the colorimetric slide.

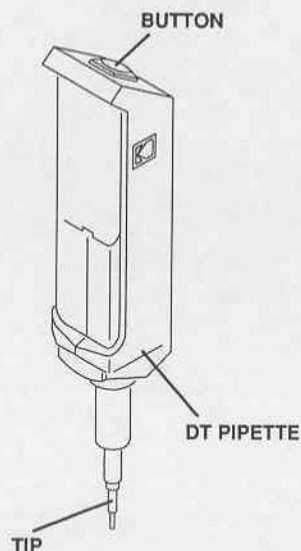
Components

PIPETTE and TIPS

The *Kodak Ektachem* DT PIPETTE aspirates fluid and dispenses an accurate 10 mL drop of the fluid on the slide. **A new disposable TIP must be installed on the end of the PIPETTE before each aspiration.** The operator presses the **BUTTON** once to aspirate fluid, and once again to dispense fluid on the slide in the SPOTTING STATION.

A complete guide to the correct operating technique for the DT PIPETTE is in the Operator's Manual.

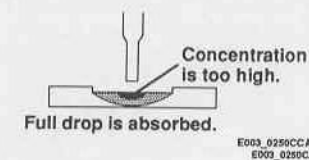
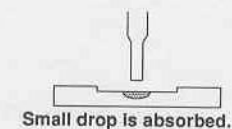
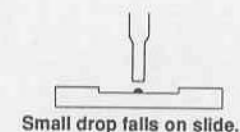
2 styles of the DT PIPETTE are now used at customer sites. The first style was distributed with the original *DT60* ANALYZERS. The other style was supplied with version 10.7 software, Modification No. 5. This newer style is used with both the *Kodak Ektachem* DTSC MODULE and with the *DT60* ANALYZER. The newer "pullback" DT PIPETTE has an important feature that the original PIPETTE did not have. The original PIPETTE aspirates 10 mL of fluid into the TIP. The "pullback" PIPETTE also aspirates 10 mL of fluid and then makes a beep. The beep is a signal to the operator to remove the PIPETTE from the SAMPLE CUP. 2.5 seconds after the beep, the "pullback" PIPETTE aspirates 2 mL of air to pull the fluid further into the TIP.



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E003_0019CA

The additional air in the TIP prevents a small drop of fluid from falling onto the slide before the operator actuates the **BUTTON** to dispense the 10 mL drop. The small drop is absorbed first. Then the full drop is dispensed, and is absorbed by the same area of the slide that has the small drop. That area in the center of the slide will have a darker color and a higher concentration than the outer area. The following chemistries are sensitive to this condition:

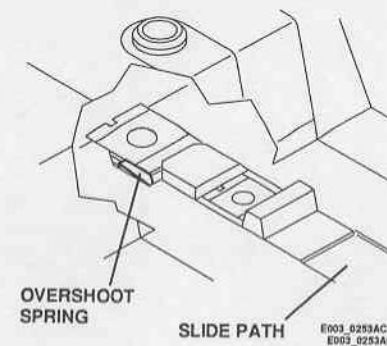
- TRIG
- NH_3/CREA
- AMYL
- CHOL
- HDLC
- TP
- all rate chemistries processed on the DTSC MODULE



E003_0259CCA
E003_0259CA

OVERSHOOT SPRING

An **OVERSHOOT SPRING** holds the slide toward the right side of the **SPOTTING STATION** and prevents the slide from advancing too far on the **SLIDE PATH**.



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E003_0253AC

PIPETTE LOCATOR

TIP SEAT

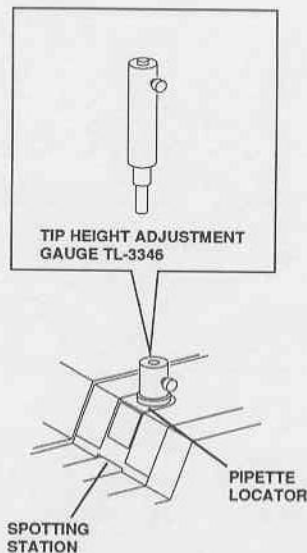
TIP HEIGHT ADJUSTMENT GAUGE TL-3346

The PIPETTE LOCATOR holds the PIPETTE above the slide in the SPOTTING STATION, in an exact position to dispense a drop on the center of the slide. Within the PIPETTE LOCATOR is an adjustable TIP SEAT. The TIP SEAT maintains a given distance between the TIP and the slide. This distance is important because the slides absorb the aspirated drop at an exact rate. The PIPETTE provides a uniform dispense rate, but if the distance between the TIP and the slide is not correct, the drop will not have the correct shape. The drop will not spread smoothly over the surface of the slide, or part of the drop will adhere to the TIP.

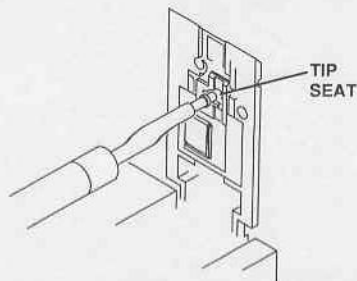
The following chemistries are most sensitive to errors in the height adjustment of the TIP SEAT:

- TRIG
- HDLC
- all rate chemistries processed on the DTSC MODULE

A special tool, the TIP HEIGHT ADJUSTMENT GAUGE TL-3346, is used to check the height adjustment of the TIP SEAT. For additional information about the adjustment of the TIP SEAT, see the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.



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E003_0055AA

SPOT DETECTOR SENSOR

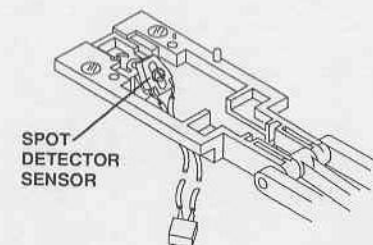
The SPOT DETECTOR SENSOR has an LED that projects a light beam onto the web of the slide in the SPOTTING STATION. Some of this light is reflected up to the SENSOR. The SENSOR has a voltage signal that changes with variations in the amount of detected light.

The computer in the DT60 ANALYZER monitors the voltage signal from the SPOT DETECTOR SENSOR. When a drop of fluid is dispensed onto the slide, the reflectance from the slide changes, and the voltage signal from the SPOT DETECTOR SENSOR changes. This voltage change indicates to the computer that the drop was dispensed onto the slide. The computer expects the changed voltage and executes a command signal to start the Slide Transport System and move the slide to the INCUBATOR.

The webs on slides of different colorimetric chemistries have different reflectances. The range of reflectances, from the lightest to the darkest, is:

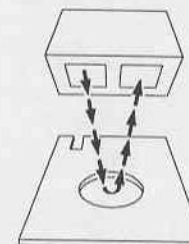
NH₃/CREA ----- Lightest
GLU
TRIG
|
URIC
TBIL
TP ----- Darkest

The instructions for the adjustment of the SPOT DETECTOR SENSOR include checking the reflectance from the lightest and the darkest slides at the customer site. The procedure allows the field service personnel to determine if the SPOT DETECTOR SENSOR is adjusted to a voltage that allows successful operation with slides of all reflectances.

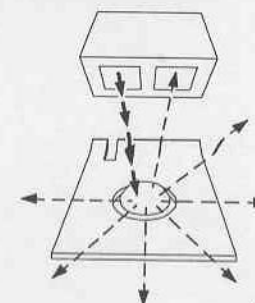


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E003_0245AC

No Drop.
Normal Reflectance.



Drop Dispensed.
Decreased Reflectance.

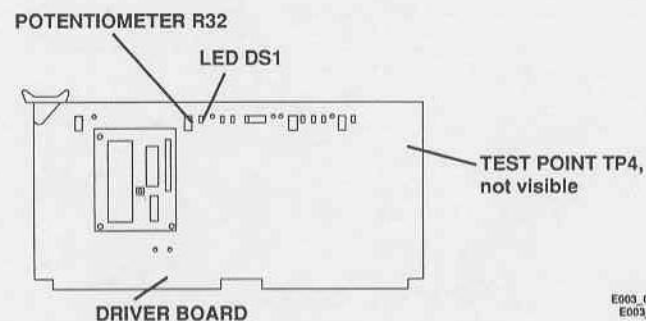


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E003_0247CC

DRIVER BOARD

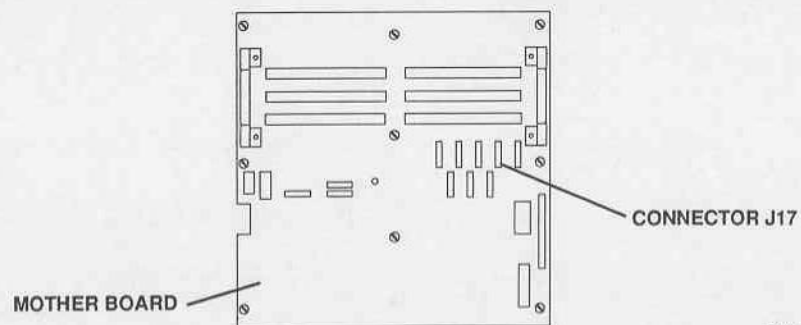
In the Multi-Board Configuration, the following components on the DRIVER BOARD relate to the metering system:

- LED DS1 energizes when the signal from the SPOT DETECTOR SENSOR is received, indicating that fluid has been dispensed onto the slide.
- POTENTIOMETER R32 sets the gain for the voltage from the SPOT DETECTOR SENSOR.
- TEST POINT TP4 provides a monitoring location for the voltage signal, with the applied gain, from the SPOT DETECTOR SENSOR.



MOTHER BOARD

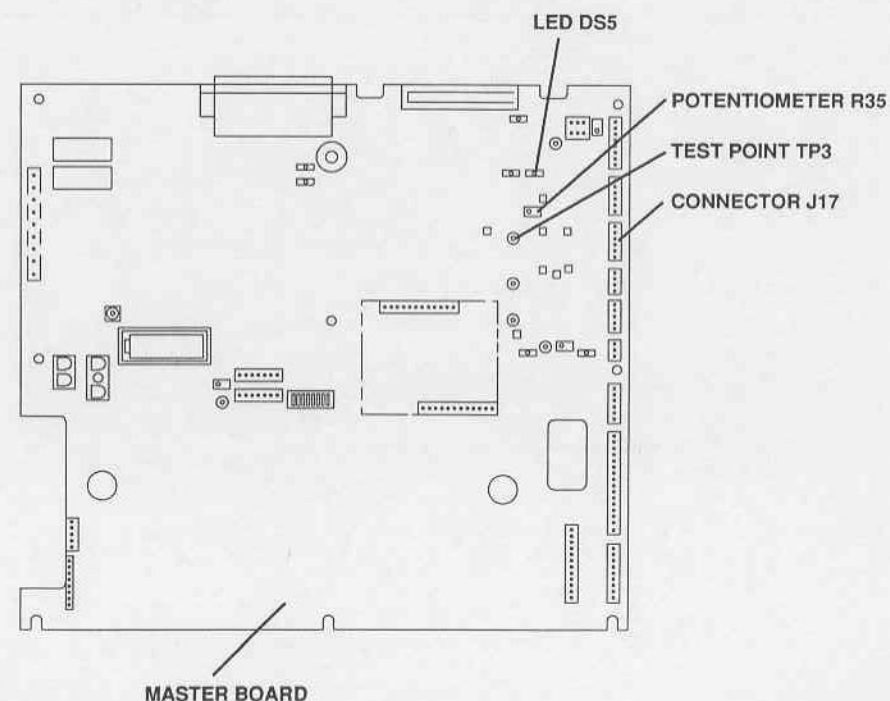
On the MOTHER BOARD in the Multi-Board Configuration, CONNECTOR J17 provides power and data communication for the SPOT DETECTOR SENSOR.



MASTER BOARD

In the Single-Board Configuration, some components of the MASTER BOARD relate to the Metering System:

- CONNECTOR J17 - provides power and data communication for the SLIDE DETECTOR SENSOR.
- LED DS5 energizes when the signal from the SPOT DETECTOR SENSOR is received, indicating that fluid has been dispensed onto the slide.
- POTENTIOMETER R35 sets the gain for the voltage signal from the SPOT DETECTOR SENSOR.
- TEST POINT TP3 provides a monitoring location for the voltage signal, with the applied gain, from the SPOT DETECTOR SENSOR.



Sequence of Operation

- [1] The operator inserts the slide manually into the SPOTTING STATION, using the SLIDE ADVANCE LEVER.
- [2] The BAR CODE READER reads the BAR CODE and the slide is identified. For more information on this system, see "Slide Identification System" in this section of the service manual.
- [3] After the slide is identified successfully, the message "SPOT SLIDE WITH FLUID" is displayed in the LC DISPLAY
- [4] A delay of 2 seconds allows the circuit to become stable.
- [5] The SPOT DETECTOR SENSOR begins to monitor the reflectance from the slide.

NOTE

The Operator's Manual has full instructions for using the DT PIPETTE.

- [6] The operator installs a new TIP onto the PIPETTE.
- [7] The operator places the TIP into the sample fluid.
- [8] The operator presses the BUTTON to aspirate the fluid.
- [9] The PIPETTE makes a beep as a signal for the operator to remove the PIPETTE from the fluid.
- [10] If the PIPETTE is a "pullback" PIPETTE, an additional 2 mL of air will be aspirated.
- [11] The PIPETTE makes an additional beep.
- [12] The operator uses a tissue to remove excess fluid from the outside of the TIP.
- [13] The operator checks the quantity of fluid in the TIP.
- [14] The operator inserts the PIPETTE into the PIPETTE LOCATOR.
- [15] When the drop is dispensed onto the slide, the reflectance of the slide changes.
- [16] The SPOT DETECTOR SENSOR detects the changed reflectance, and the voltage signal changes.
- [17] The computer detects the changed signal and executes a command signal to actuate the Slide Transport System and move the slide into the INCUBATOR.

Function

Components

BAR CODE READER,
Not visible

Not visible

PIPETTE LOCATOR ASSEMBLY

SLIDE HANDLE ASSEMBLY

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E003_0185AS

Diagram illustrating the components of a Spotting Station:

- SPOTTING STATION**: The overall assembly shown.
- TRACK ASSEMBLY**: The base structure supporting the surface plate.
- SURFACE PLATE**: The flat, horizontal surface used for layout.
- INNER EDGE**: The edge of the surface plate closest to the track assembly.

OVERSHOOT SPRING

E003_0253AC

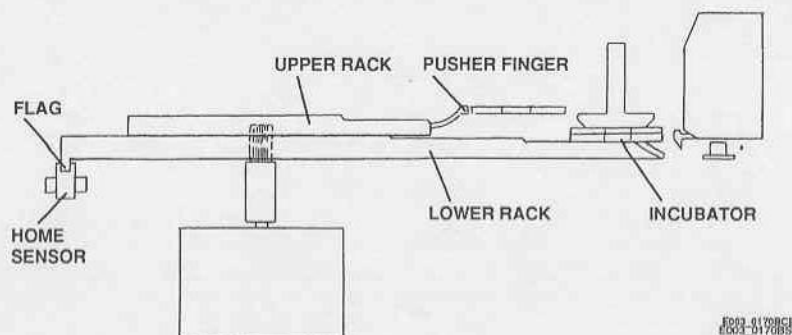
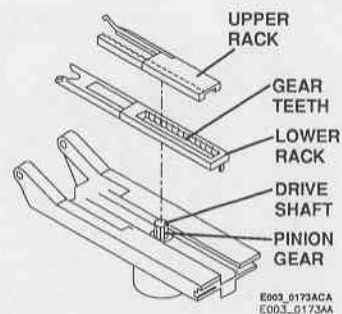
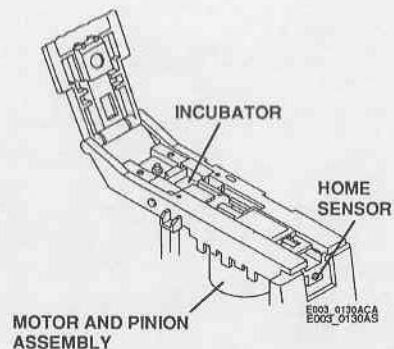
A detailed line drawing of the Spot Detector Sensor assembly. It shows a rectangular metal base plate with various mounting holes. A sensor unit is mounted on the plate, with a cable extending from it. A label 'SPOT DETECTOR SENSOR' with a leader line points to the sensor unit. The assembly is shown in a perspective view, highlighting its three-dimensional structure.

**MOTOR AND PINION ASSEMBLY
LOWER RACK/FLAG
UPPER RACK/PUSHER FINGER
HOME SENSOR**

The MOTOR AND PINION ASSEMBLY, the UPPER RACK, the LOWER RACK, and the HOME SENSOR operate together to push the slide from the SPOTTING STATION to the INCUBATOR, and from the INCUBATOR to the READ STATION, then to the DISPOSAL BOX. The MOTOR AND PINION ASSEMBLY has a PINION GEAR attached to the DRIVE SHAFT. The MOTOR can drive the GEAR in both directions.

The UPPER RACK and the LOWER RACK have GEAR TEETH that have an interface with the PINION GEAR. The RACKS are installed so that the GEAR TEETH on the UPPER RACK touch the PINION GEAR on one side, and the GEAR TEETH on the LOWER RACK touch the PINION GEAR on the opposite side. Rotating the DRIVE SHAFT causes the RACKS to move together, but in opposite directions.

The HOME SENSOR is installed under the FRAME of the TRACK ASSEMBLY. The DT60 ANALYZER uses the HOME SENSOR to monitor the position of the LOWER RACK. A FLAG is installed on the bottom surface of the LOWER RACK. When this FLAG inserts into the HOME SENSOR, the SENSOR executes a +5 V dc logic Hi signal. The computer recognizes the logic Hi signal as the home-position.



Cross-Section View of the UPPER RACK and the LOWER RACK in Home-Position

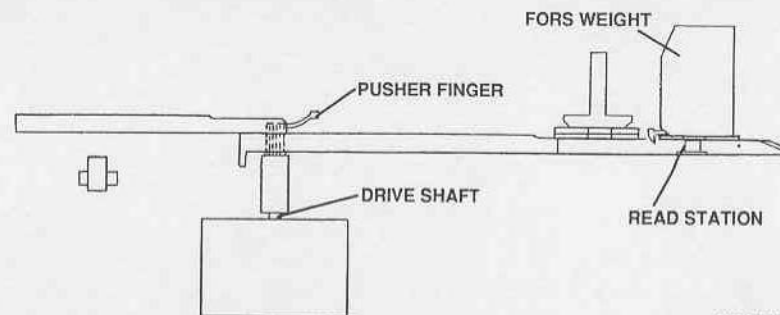
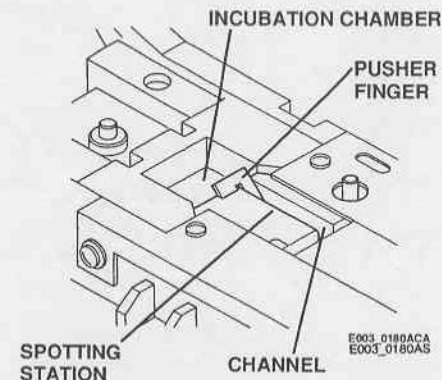
**MOTOR AND PINION ASSEMBLY
LOWER RACK/FLAG
UPPER RACK/PUSHER FINGER
HOME SENSOR**

- Continued

When the computer receives a signal from the SPOT DETECTOR SENSOR to indicate that metering has occurred, the computer sends a drive signal to the MOTOR AND PINION ASSEMBLY. The MOTOR rotates the DRIVE SHAFT clockwise for a given number of steps, driving the UPPER RACK toward the INCUBATOR. A PUSHER FINGER on one end of the UPPER RACK inserts up into a CHANNEL in the SPOTTING STATION. As the UPPER RACK moves toward the INCUBATOR, the PUSHER FINGER touches the edge of the slide in the SPOTTING STATION and pushes until the slide falls from the surface of the SPOTTING STATION into the INCUBATION CHAMBER.

Then the MOTOR drives in the counterclockwise direction to return the RACKS to the home-position. The computer monitors the signal from the HOME SENSOR and the number of steps made by the MOTOR. The software expects the MOTOR to make the same number of steps in each direction. The logic Hi signal from the HOME SENSOR indicates when the LOWER RACK reaches the home-position.

After a slide remains in the INCUBATOR CHAMBER for 313 seconds, the computer sends a drive signal to the MOTOR AND PINION ASSEMBLY. The MOTOR rotates the DRIVE SHAFT counterclockwise for a given number of steps, driving the LOWER RACK from the home-position toward the READ STATION. A STEP on the top surface of the LOWER RACK engages the bottom slide in the INCUBATOR and pushes that slide under the FORS WEIGHT toward the READ STATION.



RACKS in Position for a Slide Reading

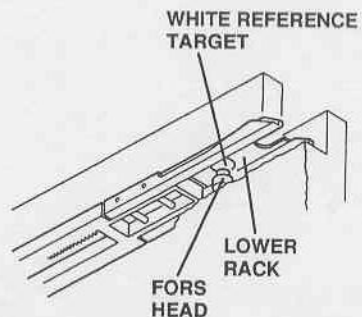
**MOTOR AND PINION ASSEMBLY
LOWER RACK/FLAG
UPPER RACK/PUSHER FINGER
HOME SENSOR**

- Continued

The MOTOR stops when the WHITE REFERENCE TARGET on the bottom surface of the LOWER RACK is over the FORS HEAD. The FORS ASSEMBLY makes 3 readings of the WHITE REFERENCE TARGET and 3 dark readings. Then the MOTOR starts again to move the slide beyond the READ STATION. If an old slide is already in the READ STATION, the TIPS of the LOWER RACK push that slide until it falls into the SLIDE DISPOSAL BOX below the SLIDE TRACK.

The MOTOR stops and drives in the opposite, or clockwise, direction to move the new slide against the rear surfaces of the PAWLS and return the RACKS to the home-position. The computer expects approximately the same number of steps in each direction. The signal from the HOME SENSOR indicates when the LOWER RACK reaches the home-position.

After the slide is staged over the FORS HEAD and the LOWER RACK is moved from under the slide to the home-position, the FORS ASSEMBLY makes 3 sample readings.



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E003_0188A2B

LOWER RACK, Visible from the Bottom

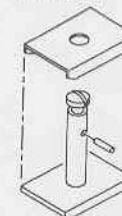
**LOWER ARM
UPPER ARM
PRESSURE PAD ASSEMBLY**

A PRESSURE PAD ASSEMBLY, installed in the PIPETTE LOCATOR ASSEMBLY, forms the top of the INCUBATOR and provides a seal to prevent evaporation of the sample fluid and to provide a stable temperature the heat. 3 moving parts mechanically lift the PRESSURE PAD to allow slide movement into the INCUBATOR. Then the PRESSURE PAD is lowered mechanically onto the top slide in the INCUBATOR.

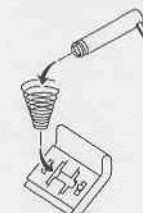
When the UPPER RACK moves toward the INCUBATOR, a RAMP on the UPPER RACK engages and lifts PIN A on the side of the LOWER ARM. The LOWER ARM is moved up. PIN B on the top of the LOWER ARM inserts through holes in the SURFACE PLATE and the PIPETTE LOCATOR COVER and engages the bottom surface of the UPPER ARM. When the LOWER ARM moves up, the UPPER ARM is lifted.

A RAMP on the UPPER ARM engages PIN C installed in the SHAFT of the PRESSURE PAD, lifting the PRESSURE PAD. When the MOTOR AND PINION ASSEMBLY drives the UPPER RACK in the opposite direction, the parts operate in the reversed order, allowing the PRESSURE PAD to move down onto the top slide in the INCUBATOR.

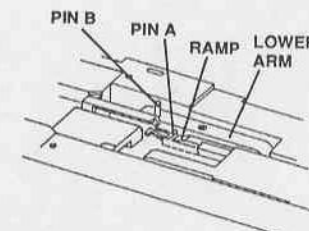
**TYPE 1
PRESSURE PAD
ASSEMBLY**



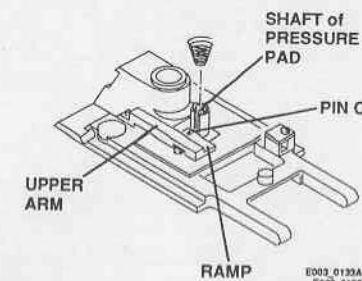
**TYPE 2
PRESSURE PAD
ASSEMBLY**



E003_0240ACA
E003_0240ACB



E003_0131ACA
E003_0131ACB



E003_0133ACB
E003_0133ACD

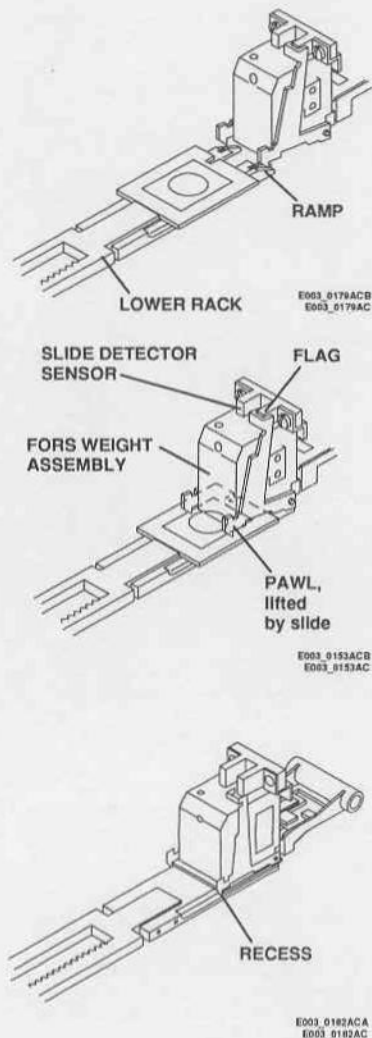
PIPETTE LOCATOR — COVER Removed

FORS WEIGHT ASSEMBLY PAWLS SLIDE DETECTOR SENSOR

When the LOWER RACK moves a slide from the INCUBATOR to the READ STATION, the slide is pushed under the 2 PAWLS installed in the FORS WEIGHT ASSEMBLY. The PAWLS are lifted up onto the slide, and a FLAG on the top of the RIGHT PAWL inserts into the SLIDE PRESENT SENSOR. A +5 V dc logic Hi signal is executed. As the slide enters the READ STATION under the FORS WEIGHT, the PAWL continues to be lifted and the logic Hi signal continues. The slide moves through the READ STATION until the PAWLS fall off the other edge of the slide into the RECESS on the LOWER RACK. The SLIDE DETECTOR SENSOR executes a logic Lo signal of approximately 0 V.

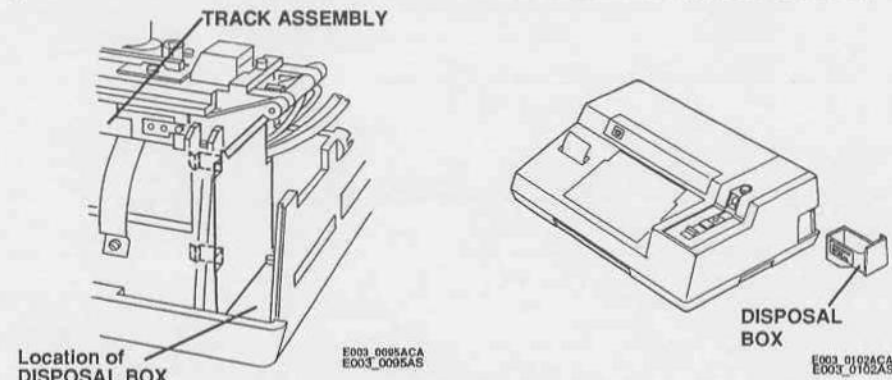
At approximately step 92 to step 94, the MOTOR drives in the opposite direction, and the LOWER RACK returns to the home-position. The slide moves a minimum distance with the LOWER RACK, but the slide is stopped by the rear edges of the PAWLS. The FORS WEIGHT holds the slide down over the FORS HEAD in a stable and precise position for the slide reading.

The computer monitors the status of the signal from the SLIDE DETECTOR SENSOR to determine if the RIGHT PAWL is lifted by a slide. The software expects a logic Hi signal when the MOTOR has made 66 steps and a logic Lo signal at 91 steps.



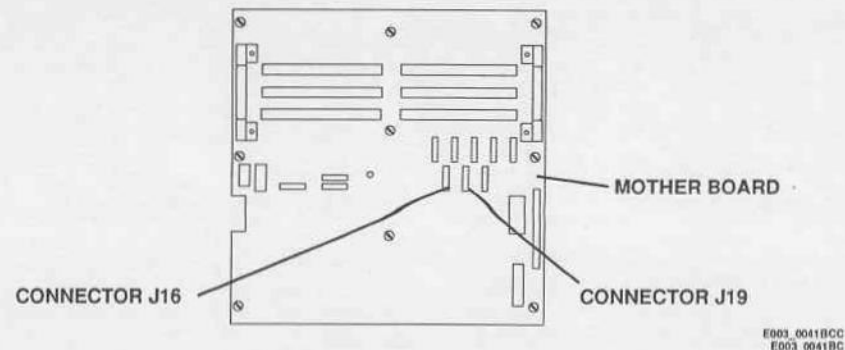
DISPOSAL BOX

The DISPOSAL BOX is installed in the rear of the ANALYZER, below the TRACK ASSEMBLY. If only one slide is processed, it remains in the READ STATION until another slide is processed. When the next slide is processed, the LOWER RACK pushes the first slide over the end of the TRACK into the DISPOSAL BOX.



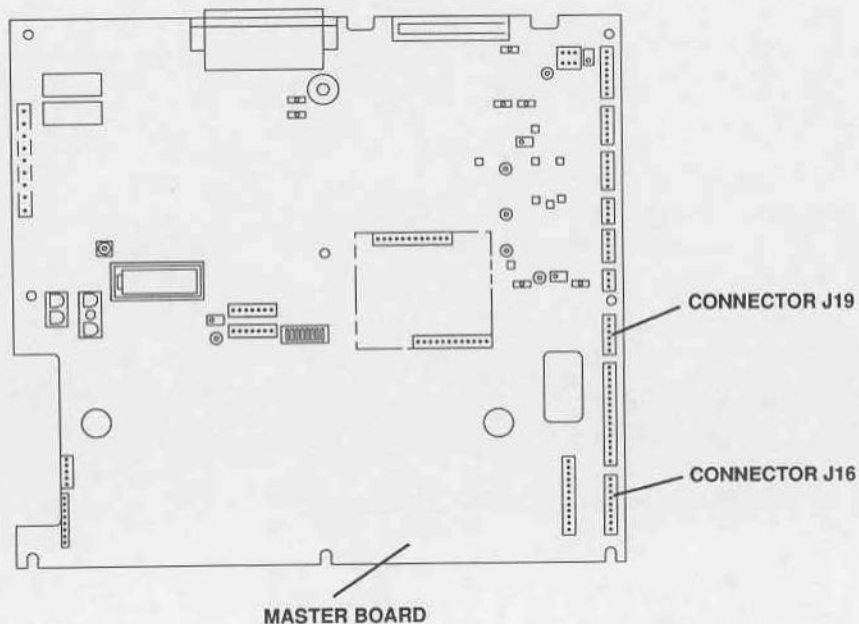
MOTHER BOARD

In the Multi-Board Configuration, CONNECTOR J16 on the MOTHER BOARD provides power and data communication for the MOTOR AND PINION ASSEMBLY. CONNECTOR J19 provides power and data communication for the HOME SENSOR.



MASTER BOARD

In the Single-Board Configuration, CONNECTOR J16 provides power and data communication for the MOTOR AND PINION ASSEMBLY. CONNECTOR J19 provides power and data communication for the HOME SENSOR.



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E003_0113DC

Sequence of Operation

- [1] The operator manually loads a slide at the loading position, and uses the SLIDE ADVANCE LEVER to move the slide to the SPOTTING STATION.
- [2] After the Slide Identification System identifies the slide, and the operator uses the *Kodak Ektachem* DT PIPETTE to aspirate and dispense a drop of fluid onto the slide, the UPPER RACK moves toward the READ STATION and the PUSHER FINGER on the UPPER RACK pushes the slide from the SPOTTING STATION into the INCUBATOR.
- [3] The UPPER RACK also actuates the LOWER ARM, the UPPER ARM, and the PRESSURE PAD STEM, raising the PRESSURE PAD.
- [4] The UPPER RACK returns to the home-position, allowing the PRESSURE PAD to move down onto the top of the slide in the INCUBATOR.
- [5] After the slide has remained in the INCUBATOR for approximately 5 minutes, the LOWER RACK moves toward the READ STATION, pushing the bottom slide out of the INCUBATOR and under the FORS WEIGHT, over the FORS HEAD. As the slide moves under the FORS WEIGHT, the PAWLS are lifted to insert the FLAG on the top of the RIGHT PAWL into the SLIDE PRESENT SENSOR. The computer monitors both the steps of the MOTOR AND PINION ASSEMBLY and the signal from the SLIDE PRESENT SENSOR. If the signal from the SENSOR is logic Hi at the expected time, the computer detects that the slide is in the position for a reading.
- [6] As the LOWER RACK moves toward the home-position, the slide is registered against the back of the PAWLS, directly over the FORS HEAD.
- [7] The slide remains in the READ STATION until the next slide is processed. The points on the LOWER RACK push the first slide into the DISPOSAL BOX as the next slide moves into the READ STATION.

Temperature Monitoring and Control System

Function

The Temperature Monitoring and Control System operates to obtain and maintain a stable and continual temperature for the slides during the incubation time. The temperature in the INCUBATION CHAMBER is maintained at 36.7° to 37.3°C (98° to 99°F).

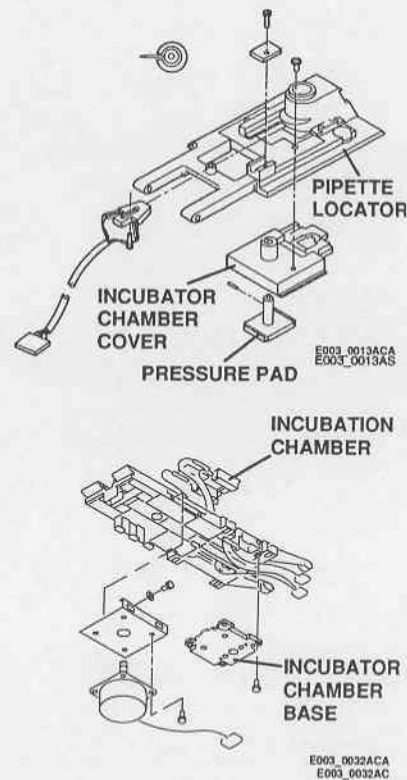
Components

INCUBATOR CHAMBER BASE
INCUBATION CHAMBER
INCUBATOR CHAMBER COVER
PRESSURE PAD

After a drop is metered onto the slide, the Slide Transport System moves the slide into the INCUBATOR for heating. The INCUBATOR is formed by the combination of the following parts:

INCUBATOR CHAMBER BASE
INCUBATION CHAMBER
INCUBATOR CHAMBER COVER
PRESSURE PAD

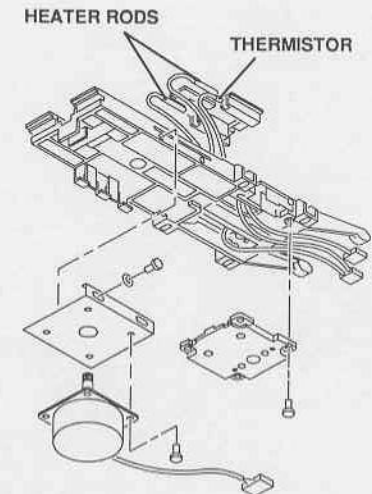
The metal INCUBATOR CHAMBER BASE absorbs and releases heat and provides a bottom contact surface for the slides during incubation. The INCUBATION CHAMBER is also made of metal to hold and release heat. The INCUBATION CHAMBER forms the sides of the INCUBATOR. The PRESSURE PAD is installed in the INCUBATOR CHAMBER COVER in the PIPETTE LOCATOR and is moved up and down by the Slide Transport System to allow slides to move into the INCUBATOR. When the PRESSURE PAD is not lifted, it covers the INCUBATOR and keeps the slides in contact with the bottom of the INCUBATOR CHAMBER BASE. Thermal contact is important for correct heating of the slides.



HEATER RODS
THERMISTOR
FAN

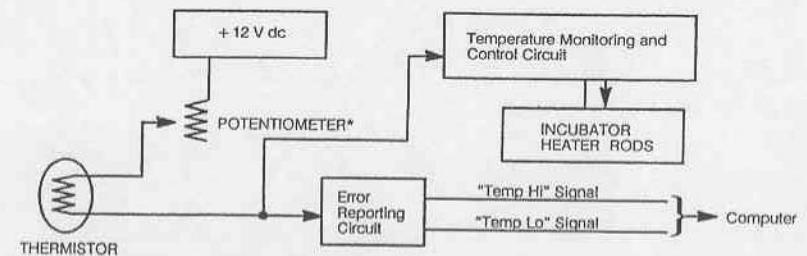
Temperature Monitoring and Control Circuit

The HEATER RODS and the THERMISTOR are installed in the INCUBATION CHAMBER. The THERMISTOR measures the temperature of the metal in the INCUBATION CHAMBER for 2 purposes.



One voltage signal from the THERMISTOR provides data to the computer about the temperature of the INCUBATOR. Another voltage signal from the THERMISTOR allows the Temperature Monitoring and Control Circuit to maintain the correct temperature in the INCUBATOR.

The Temperature Monitoring and Control Circuit monitors the voltage from the THERMISTOR and compares that voltage with a reference voltage. A comparator circuit on the DRIVER BOARD or the MASTER BOARD determines if cooling or heating of the INCUBATOR is necessary.

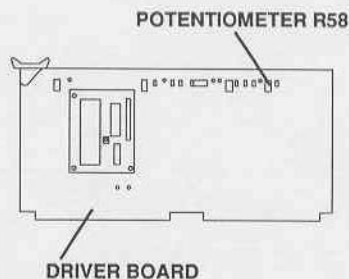


* DRIVER BOARD, R58 in Multi-Board configuration
MASTER BOARD, R73 in Single Board configuration

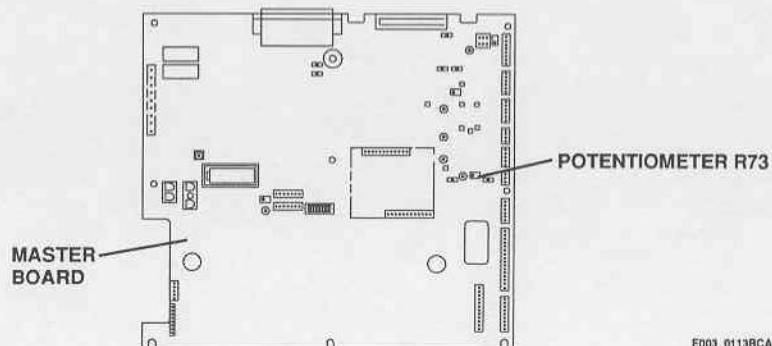
**HEATER RODS
THERMISTOR
FAN**

Temperature Monitoring and Control Circuit - Continued

+12 V dc is supplied to the THERMISTOR through POTENTIOMETER R58 on the DRIVER BOARD in Multi-Board units, or through POTENTIOMETER R73 on the MASTER BOARD in Single-Board units. In the temperature adjustment for the INCUBATOR, rotation of the POTENTIOMETER establishes a "set point". The set point is the center of a voltage range for the normal operating temperature for slide processing. The computer allows a normal temperature variation of $\pm 0.3^{\circ}\text{C}$ from the set point. When the set point is changed, the high and low limits in the software are changed automatically.



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E003_01138C

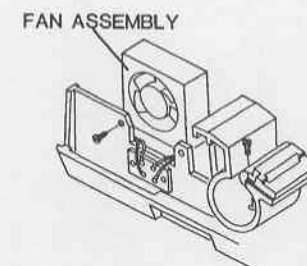
IMPORTANT

To conduct the heat correctly, THERMAL COMPOUND TL-2192 is necessary for the installation of the HEATER RODS and the THERMISTOR. See the Parts and Removals for the DT60 ANALYZER, section 10 in this manual.

If the temperature in the INCUBATOR is lower than the low limit for the set point, the HEATER RODS are energized to heat. If the temperature is higher than the high limit for the set point, the HEATER RODS are deenergized.

In Multi-Board units, a FAN ASSEMBLY starts when the DT60 ANALYZER is energized. The FAN ASSEMBLY then operates continually to move air through the INCUBATOR, the SPOTTING STATION, and the READ STATION.

In Single-Board units, the FAN ASSEMBLY starts when the temperature of the INCUBATOR increases to 0.5°C below the set point. The FAN stops when the temperature decreases to $< 0.5^{\circ}$ below the set point.



E003_0023ASA

Optics/Slide Reading System

Function

To be able to read colorimetric slides, the *DT60* ANALYZER requires a stable, uniform source of light. The Optics System provides light for the readings. This section includes information about the hardware that provides the light path for the slide readings.

Components

FORS ASSEMBLY

Using the first letter of each word in the name, "Fiber Optics Read System", makes the new word, "FORS". The FORS ASSEMBLY provides the colorimetric reading ability for the *DT60* ANALYZER.

CONNECTOR J13 provides data communication between the FORS ASSEMBLY and the MOTHER BOARD in Multi-Board units, or the MASTER BOARD in Single-Board units.

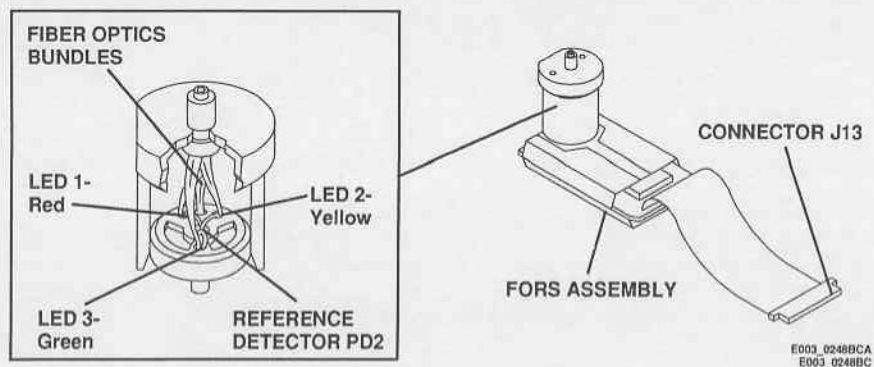
3 LEDS in the bottom of the component provide light for the readings:

LED 1 is red - used for BUN/UREA, URIC, HDLC, PHOS, and MG tests

LED 2 is yellow - used for CREA and NH₃ tests

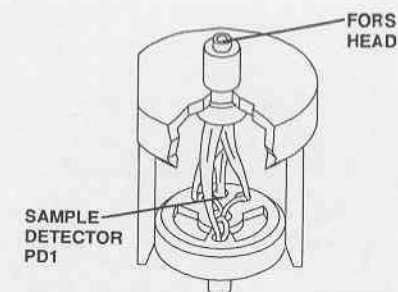
LED 3 is green - used for AMYL, CHOL, GLU, Hb, TBIL, TP, and TRIG tests

3 FIBER OPTIC BUNDLES transmit the light from each of the LEDS. Each of these BUNDLES is divided to transmit the light to 2 points. One part of the BUNDLE transmits light from the LED to the REFERENCE DETECTOR PD2. This DETECTOR monitors the amount of light emitted by the LEDS. The circuit in the FORS ASSEMBLY uses the signal from the REFERENCE DETECTOR and adjusts the intensity of the light by increasing or decreasing the voltage to the LEDS.



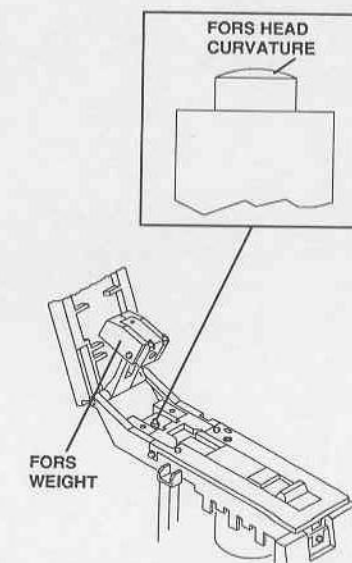
Another part of the FIBER OPTICS BUNDLE transmits light from the LED to the FORS HEAD on the top of the FORS ASSEMBLY. This light is reflected from a slide or reference surface in the READ STATION. A separate FIBER OPTICS BUNDLE then transmits the reflected light to the SAMPLE DETECTOR PD1 in the bottom of the FORS ASSEMBLY. The computer monitors the SAMPLE DETECTOR PD1 for the slide reading data.

The part of the FORS ASSEMBLY that touches the slide is the FORS HEAD. The FORS HEAD has a precise curve and finish, to provide optimal light reflectance from the slide. See the following section about the FORS WEIGHT for additional important information about the CURVATURE of the slide.



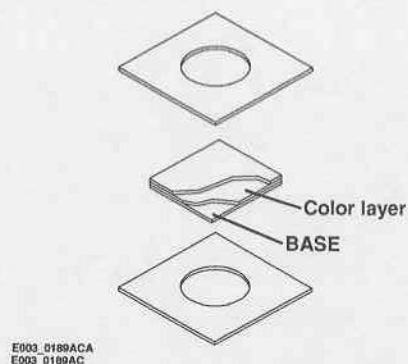
FORS WEIGHT

The FORS WEIGHT bends the slide over the FORS HEAD during slide readings. The LOWER RACK lifts the FORS WEIGHT before the slide enters the READ STATION. When the slide is in the correct position, the FORS WEIGHT moves down over the slide and bends it over the FORS HEAD.



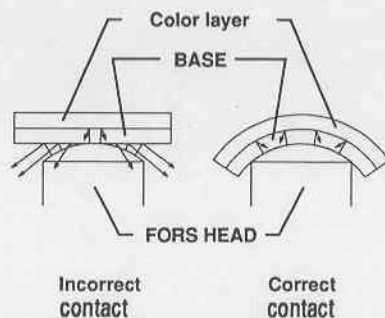
FORS WEIGHT - Continued

Bending the slide correctly over the FORS HEAD is very important for correct readings. The bottom layer is transparent *Estar* BASE. The color layer above the BASE has the chemistry that provides the color surface used for colorimetric readings.



When the FORS WEIGHT bends the slide correctly over the FORS HEAD, most of the light is transmitted up through the transparent layer on the bottom. Then the light is reflected from the color layer down to the FORS HEAD. If the slide is not pressed firmly down onto the FORS HEAD, the light can reflect from the glossy surface of the BASE. This condition causes "flare", with excessive reflectance and D_R values that are too low.

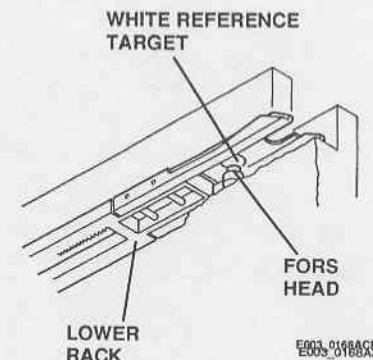
The FORS WEIGHT also has a HEATER that maintains the temperature in the READ STATION at approximately $+40^\circ$ to $+50^\circ$ C. This temperature prevents any condensation on cold surfaces of any wet gases from the slide. The condensation can hold ammonia gas that is the result of processing NH_3 , CREA, and BUN tests. Ammonia gas will cause errors in the precision and accuracy of test results.



WHITE REFERENCE TARGET

The WHITE REFERENCE TARGET is a white area on the bottom of the LOWER RACK. When the WHITE REFERENCE TARGET is in the position over the FORS HEAD, the DT60 ANALYZER uses the white surface for an internal white reference reading. The computer uses the correction-factors for a comparison between the internal white reference reading and a reading of the standard white reference provided by the WHITE REFERENCE SLIDE TL-3344. Conditions in the environment can cause the WHITE REFERENCE TARGET to be dirty or yellow. The correction-factors procedure allows the software to change the internal correction-factors and adjust the values to allow for some changed reflectance of the WHITE REFERENCE TARGET.

But if the WHITE REFERENCE TARGET is too dark, the correction-factors will reach a software limit that executes an error code. To obtain a new WHITE REFERENCE TARGET, installation of a new LOWER RACK is necessary.

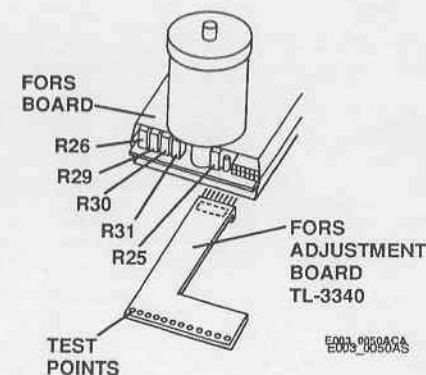


LOWER RACK, Visible from the Bottom

FORS BOARD

The FORS ASSEMBLY has a small CIRCUIT BOARD with 4 or 5 POTENTIOMETERS. The POTENTIOMETERS can be adjusted to provide the correct voltages for the LEDs.

- POTENTIOMETER R26 sets the gain of the AMPLIFIER for the output voltage.
- POTENTIOMETER R29 sets the illumination voltage for the red LED.
- POTENTIOMETER R30 sets the illumination voltage for the yellow LED.
- POTENTIOMETER R31 sets the illumination voltage for the green LED.
- POTENTIOMETER R25 adjusts the "0" (zero) or null voltage. This POTENTIOMETER is not included on newer FORS BOARDS.

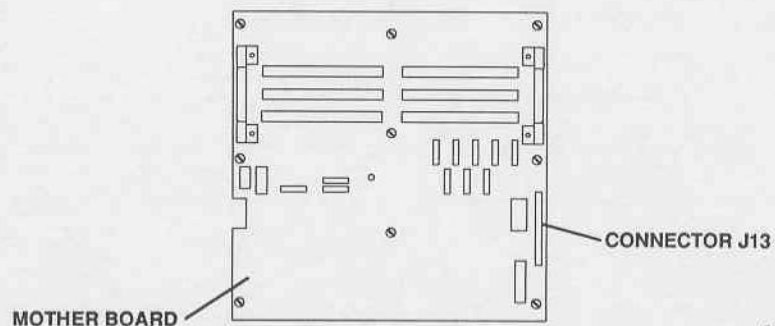


FORS ADJUSTMENT BOARD TL-3340

This special tool is inserted into the back of the FORS ASSEMBLY to provide TEST POINTS used to adjust the FORS ASSEMBLY, and to check the specifications for the POWER SUPPLY. For additional information on these procedures, see the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.

MOTHER BOARD

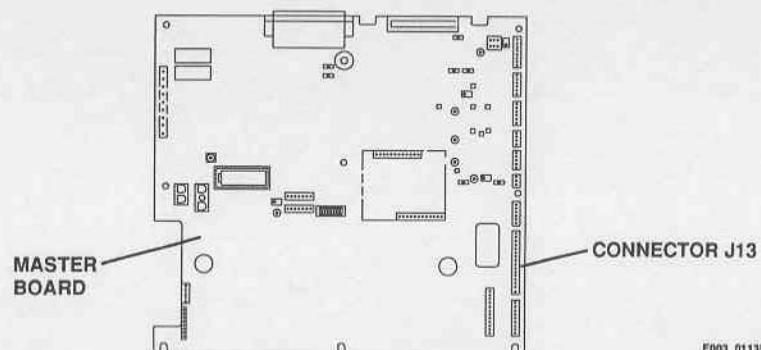
On the MOTHER BOARD in the Multi-Board Configuration, CONNECTOR J13 provides power and data communication for the FORS ASSEMBLY CIRCUIT BOARD.



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E003_0041BC

MASTER BOARD

In the Single-Board Configuration, CONNECTOR J13 provides power and data communication for the FORS ASSEMBLY CIRCUIT BOARD.



E003_0113BCB
E003_0113BC

Power Distribution System and the FAN

Function

To provide precise and accurate test results, the *DT60 ANALYZER* requires stable internal voltages. The Power Distribution System uses the main power source at the site to provide the necessary internal voltages to operate the mechanical, electrical, and electronic components in the equipment. The Power Distribution System includes the management of the ac input voltage, the conversion to dc voltage, the dc output voltages, and the ground path.

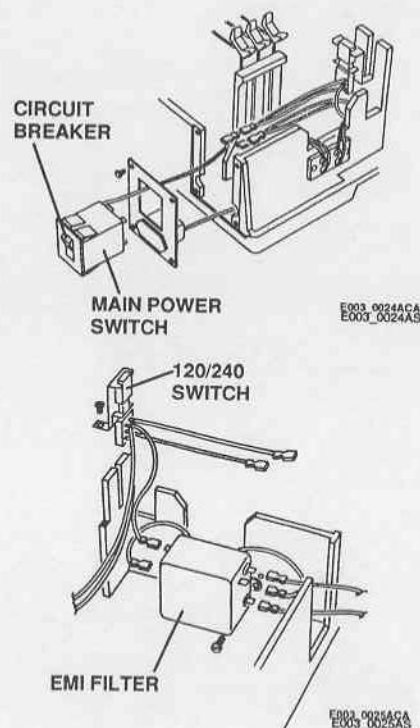
Components

MAIN POWER SWITCH 120/240 SWITCH EMI FILTER

The MAIN POWER SWITCH, the EMI FILTER, and the 120/240 SWITCH are components of the ac power distribution system. The MAIN POWER SWITCH has a CIRCUIT BREAKER and the CONNECTOR for the LINE CORD. The ac power from the site reaches the MAIN POWER SWITCH, then goes to the 120/240 SWITCH. The 120/240 SWITCH allows the customer to set the equipment for either 120 V ac or 240 V ac input voltage. The 240 V dc setting is not used in the U.S., but that setting is used in many international sites.

The Federal Communications Commission and "VDE" regulations in Europe require an EMI FILTER in the *DT60 ANALYZER*. The EMI FILTER makes a current leakage path to a ground.

Electrical noise in the main ac power line could cause malfunctions in other equipment at the customer site. The EMI FILTER prevents electrical noise in the input line and in the main ac power line.

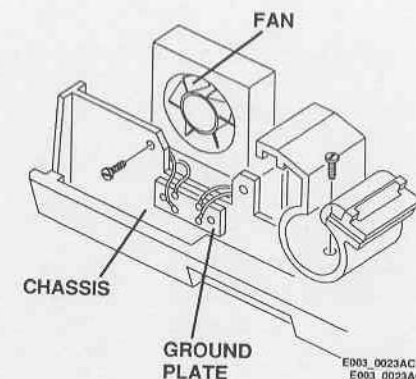


FAN

Ground Path

The FAN operates on +12 V dc and has 2 functions. The FAN pulls room air through the *DT60 ANALYZER*. The cooler room air is exchanged with the heated air from inside the ANALYZER. The air flow cools the electrical parts and removes any residual gases caused by the processing of CREA and NH_3 slides. Removal of these gases is necessary for precise and accurate test results.

A GROUND PLATE is installed on the CHASSIS adjacent to the FAN. The ground path for the *DT60 ANALYZER* to the 3-wire RECEPTACLE is connected through the GROUND PLATE.



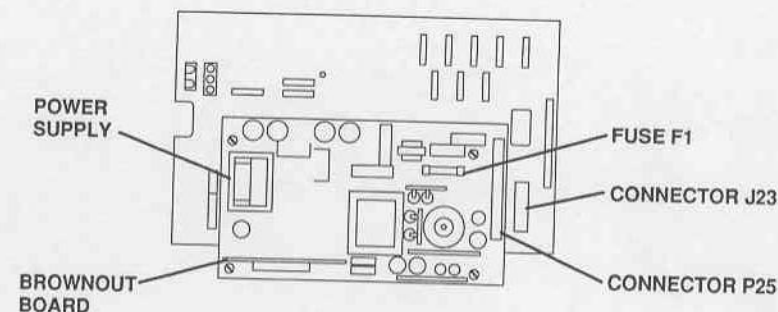
POWER SUPPLY

The POWER SUPPLY receives the main ac voltage through a CABLE to CONNECTOR P/J25. The POWER SUPPLY uses the ac voltage to provide all necessary dc voltage for operating the *DT60 ANALYZER*. The internal dc voltage is provided through CONNECTOR P/J25 to CONNECTOR P/J23 on the MASTER BOARD or the MOTHER BOARD. The POWER SUPPLY also provides power to the *DTE MODULE*.

A BROWNOUT BOARD, installed vertically on the POWER SUPPLY, has circuits to detect a variation in the main power that causes the voltage to be less than the voltage range in the site specifications. When this condition occurs, the POWER SUPPLY cannot provide stable dc voltages that are high enough to operate the computer. For additional information, see Error Code F17 in the Diagnostics for the *DT60 ANALYZER*, section 5 in this service manual.

The POWER SUPPLY has one voltage adjustment. For additional information, see the checkout procedure for the POWER SUPPLY, Adjustments and Special Procedures for the *DT60 ANALYZER*, section 8 in this service manual.

A malfunction of the POWER SUPPLY might cause FUSE F1 to open. If replacement of FUSE F1 does not repair the problem, a new POWER SUPPLY should be installed.



Sequence of Operation

- [1] The LINE CORD is connected to a 3-wire RECEPTACLE in the wall at the customer site.
- [2] The other end of the LINE CORD is connected to the EMI FILTER.
- [3] Ac voltage is routed to the VOLTAGE SELECTOR SWITCH, then to the MAIN POWER SWITCH, which is a CIRCUIT BREAKER.
- [4] If the MAIN POWER SWITCH is in the "I" position, ac voltage flows to the POWER SUPPLY.
- [5] The ac voltage is converted to dc voltage in the POWER SUPPLY.
- [6] The dc voltage from the POWER SUPPLY flows through CONNECTOR P/J25 to CONNECTOR P/J23 on the MOTHER BOARD or the MASTER BOARD.
- [7] The DT60 ANALYZER has a ground path back to the 3-wire RECEPTACLE, through the GROUND PLATE next to the FAN.

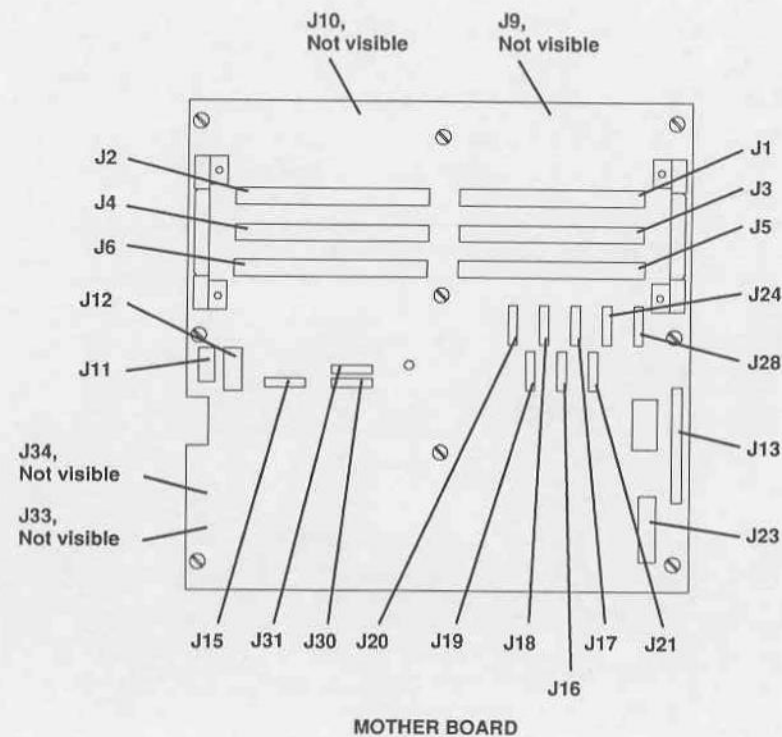
CIRCUIT BOARDS

Multi-Board Configuration

MOTHER BOARD

The MOTHER BOARD provides the communications interface for the other CIRCUIT BOARDS, for components in the *DT60* ANALYZER and for the *DTE* MODULE and the *DTSC* MODULE. The TP1 GROUND PIN for voltage measurements is located on the MOTHER BOARD. The following list indicates the CONNECTORS and components that have interface through the MOTHER BOARD:

CONNECTORS	Components
J1 and J2	CPU BOARD
J3 and J4	I/O BOARD
J5 and J6	DRIVER BOARD
J9	CDM/CLM BOARD
J10	<i>DTE</i> MODULE or ADAPTER BOX
J11	FAN in the <i>DT60</i> ANALYZER
J13	FORS BOARD
J15	KEYBOARD
J16	MOTOR AND PINION ASSEMBLY
J17	SPOT DETECTOR SENSOR
J18	BAR CODE READER
J19	HOME SENSOR
J20	COVER SWITCH
J21	THERMISTOR
J23	POWER SUPPLY
J24	INCUBATOR HEATERS
J28	SLIDE PRESENT SENSOR
J30 and J31	LC DISPLAY
J33 and J34	PRINTER



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E003_0041DC

CPU BOARD - Software Versions 9.0, 10.7, 11.0, and 11.1

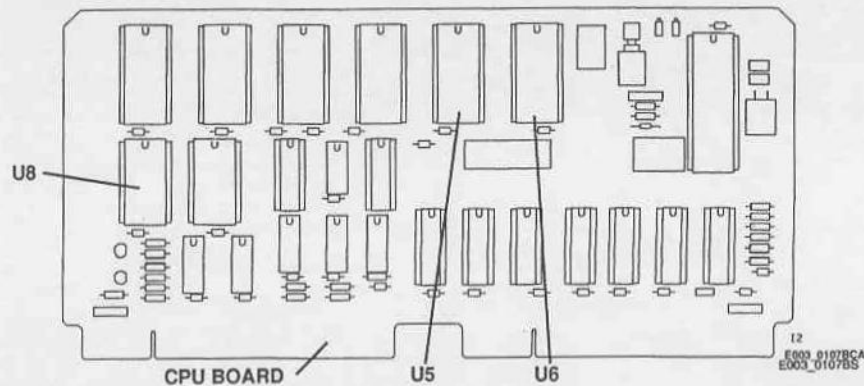
The CPU BOARD has the INTEGRATED CIRCUITS for the central processing unit, RAM, ROM, and other computer support functions like buffers and clock circuits. The CPU BOARD directs all activity in the DT60 ANALYZER through interfaces with the CDM/CLM BOARD, the I/O BOARD, the DRIVER BOARD, and in the DTE MODULE through interface with the INTERFACE BOARD. The CPU BOARD also has interface with the CONTROLLER BOARD in the DTSC MODULE for data communications.

ROM INTEGRATED CIRCUITS with software installed in the factory contain the operating program for the DT60 ANALYZER and the DTE MODULE. In DT60 ANALYZERS with version 9.0 software, the software is contained in ROM INTEGRATED CIRCUITS U1 - U5. In ANALYZERS with version 10.7 software and above, the software is contained in ROM INTEGRATED CIRCUITS U5 and U6.

The main functions of the RAM INTEGRATED CIRCUITS are calculating, monitoring operations, and storing temporary data. In DT60 ANALYZERS with version 10.7 software and above, RAM is contained in INTEGRATED CIRCUITS U1 - U3.

The NON-VOLATILE RAM has an internal power source that operates when the main power is removed from the ANALYZER. The continual power allows the NON-VOLATILE RAM to keep the necessary data in memory during the times when the ANALYZER is not connected to the main power. In CPU BOARDS with software version 10.7 and up, INTEGRATED CIRCUITS U1 - U3 are RAM ICs. INTEGRATED CIRCUIT U8 on the versions 10.7 and 11.0 CPU BOARDS is the NON-VOLATILE RAM. Examples of the necessary data stored in the NON-VOLATILE RAM are:

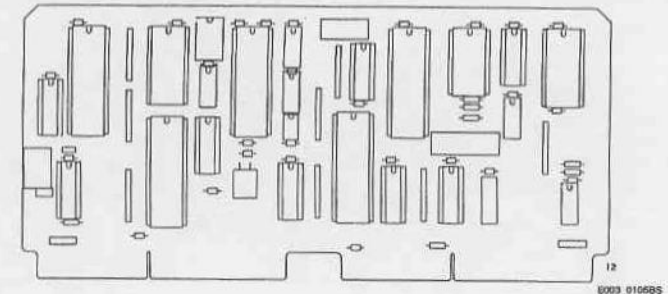
- correction-factors
- calibration parameters
- reflectance values
- calibrated generation numbers
- "post-prediction" adjustment values
- calibrated reporting modes



I/O BOARD

The I/O BOARD provides circuits and signal paths for the following components and systems in the DT60 ANALYZER:

- input for the status of the SERVICE SWITCHES on the DRIVER BOARD in Multi-Board units, or on the MASTER BOARD in Single-Board units
- input for the status of the "COVER OPEN" SWITCH
- input signals from the KEYBOARD
- data communication to the LC DISPLAY
- input for the BAR CODE READER
- input for the SPOT DETECTOR SENSOR
- drive signal to the DRIVER BOARD for the MOTOR AND PINION ASSEMBLY in the Slide Transport System
- input for the status of the HOME SENSOR
- "TEMP HI" signal
- "TEMP LO" signal
- input for the status of the SLIDE PRESENT SENSOR
- data communication to the PRINTER INTERFACE BOARD
- output "PRINTER STROBE/" signal to the PRINTER
- output "PAPER FEED/" signal to the PRINTER



I/O BOARD

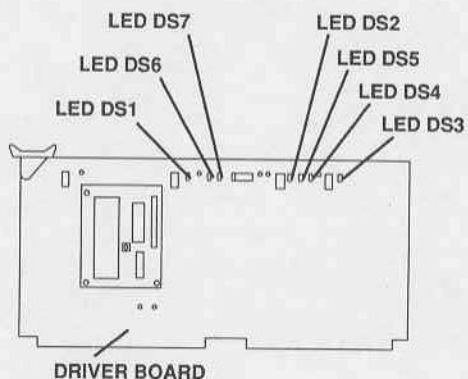
The I/O BOARD provides circuits and signal paths for the following components and systems in the DTE MODULE:

- "TED HEAT"/"TED COOL" signal
- signal path for the red LED
- commands from the CPU BOARD to the ELECTROMETER
- data from the A/D CONVERTER in the ELECTROMETER
- drive signal for the LINEAR ACTUATOR
- input for the status of the HOME POSITION SENSOR
- input for the SPOT DETECTOR SENSOR

DRIVER BOARD

The DRIVER BOARD provides circuits and signal paths for the following components and systems in the **DT60 ANALYZER**:

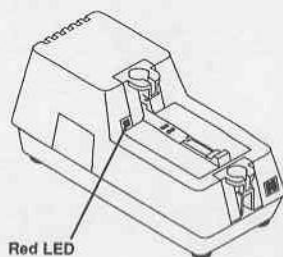
- drive signal for the beep tone
- power to and signal path, signal conditioning, and status LED DS1 for the SPOT DETECTOR SENSOR
- power to and signal path, signal conditioning, and status LED DS2 for the BAR CODE READER
- power to and signal path, signal conditioning, and status LED DS3 for the HEATER RODS
- power to and signal path, signal conditioning, and status LED DS4 for the HOME SENSOR and circuits for temperature control and monitoring
- power to and signal path, signal conditioning, and status LED DS5 for the SLIDE PRESENT SENSOR
- drive circuits and power to the MOTOR AND PINION ASSEMBLY
- +12 V dc analog through VOLTAGE REGULATOR Q25
- +12 V dc to the SPOT DETECTOR SENSOR through VOLTAGE REGULATOR Q26
- -12 V dc analog through VOLTAGE REGULATOR Q27
- -5 V dc through VOLTAGE REGULATOR Q30
- data communications with the PRINTER INTERFACE BOARD



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E003_0006BC

The DRIVER BOARD provides circuits and signal paths for the following components and systems in the **DTE MODULE**:

- drive signal for the red LED
- "TED COOL" command signal, and status LED DS6 for the THERMISTOR
- "TED HEAT" command signal, and status LED DS7 for the THERMISTOR



E004_0034ACE
E004_0034AC

Both Configurations

CLM/CDM BOARD

The CLM/CDM BOARD has 2 main components that are additional parts of the ROM in the software. The Calibration Data Module, or CDM, and the Chemistry Language Module, or CLM, are electronic devices that can be removed and installed by the customer.

The CLM contains the messages that are displayed by the LC DISPLAY and the PRINTER. Different versions of the CLM allow the DT SYSTEM to display messages in English or other languages using alphabetic characters, or in Japanese characters. A new CLM must be installed if a new test is added to the menu, or if additional displayed messages are necessary for a new software version.

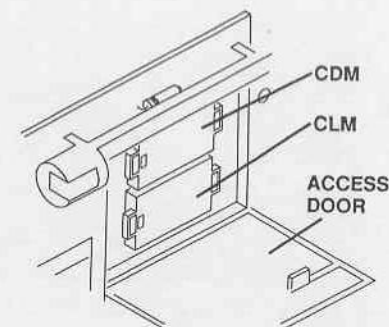
The CLM also contains some data necessary for the operation of the **DTSC MODULE**:

- The FILTER used to read each rate chemistry
- The amount of time necessary for each rate chemistry to remain in the PREHEAT STATION
- The number of readings necessary for each rate chemistry

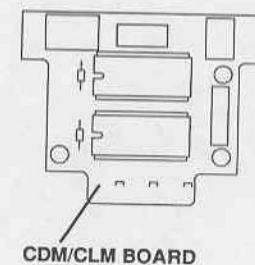
The CDM contains in ROM:

- Data for all available tests
- Generation Nos. for slides
- Generation Nos. for reference fluid
- Lot numbers for CALIBRATORS
- Splines
- Supplementary Assigned Values (SAVs)

Each possible combination of these items is stored as a separate record in the CDM. Because no checksum protection is programmed for the CDM, no checksum error will occur and be displayed if the component is damaged.



E003_0076ACC
E003_0076AA



E003_0104ACA
E003_0104AC

IMPORTANT

When diagnosing test results that are not accurate, check for a damaged CDM or a CDM that is not compatible with the slides and fluids at the customer site.

Additional information about the CDM and the CLM is in the "Operating Instructions" section of the Operator's Manual for the **Kodak Ektachem DT60 ANALYZER**.

Single-Board Configuration

MASTER BOARD

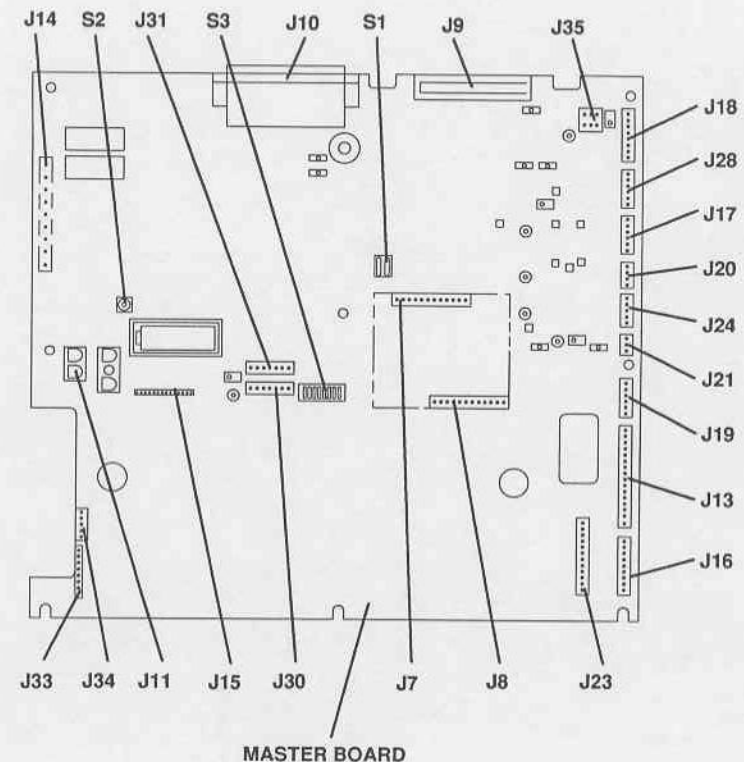
In Single-Board configuration, the MASTER BOARD is installed in the bottom of the CHASSIS. The one MASTER BOARD includes all electronic components circuits previously included in the 3 main CIRCUIT BOARDS and the MOTHER BOARD in the Multi-Board configuration. The following list indicates the components that have interface through the MASTER BOARD and the corresponding CONNECTORS.

CONNECTORS	Components
J7	PRINTER INTERFACE BOARD
J8	PRINTER INTERFACE BOARD.
J9	CDM/CLM BOARD
J10	DTE MODULE or ADAPTER BOX
J11	FAN in the DT60 ANALYZER
J13	FORS BOARD
J14	This CONNECTOR is not used.
J15	KEYBOARD
J16	MOTOR AND PINION ASSEMBLY
J17	SPOT DETECTOR SENSOR
J18	BAR CODE READER
J19	HOME SENSOR
J20	COVER SWITCH
J21	THERMISTOR
J23	POWER SUPPLY
J24	INCUBATOR HEATERS
J28	SLIDE PRESENT SENSOR
J30 and J31	LC DISPLAY
J33 and J34	PRINTER
J35	FORS HEATER

The MASTER BOARD has only 2 software components that can be removed for replacement parts: INTEGRATED CIRCUITS U6 and U14. U6 and U14 are the PROGRAMMED ROMS for the operating software. The MASTER BOARD has 2 additional parts that can be removed for replacement:

- PRINTER INTERFACE BOARD
- BATTERY for the NON-VOLATILE RAM

The PRINTER INTERFACE BOARD controls the operation of the PRINTER. The BATTERY energizes and maintains the data in the NON-VOLATILE RAM. In normal operating conditions, replacement of the BATTERY is not necessary for approximately 4 years.



MASTER BOARD

E003_0113DCI
E003_0113DC

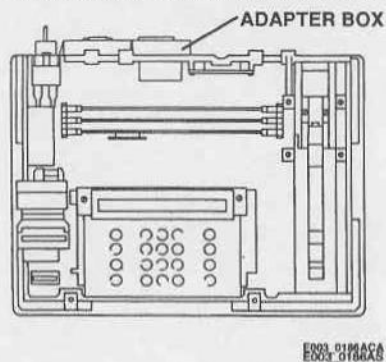
The MASTER BOARD has 3 DIP SWITCHES:

- SWITCH S1 is set for extended service at the factory and allows access to all service options, or Option 61 and above. Originally, these SWITCHES were used by field service personnel to obtain access to the service options.
- SWITCH S2 is used to reset the CPU. Pressing S2 sends a reset signal to the microprocessor to start initialization.
- SWITCH S3 is used to set the serial communications for the interface between the DT60 ANALYZER and a laboratory computer.

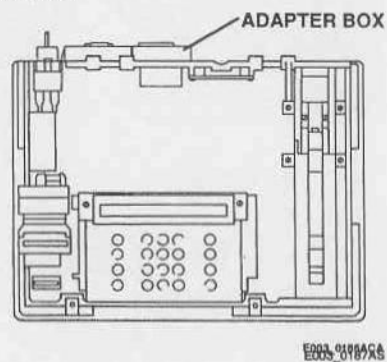
Interface with a Laboratory Computer

Function

Some *DT60* ANALYZERS have the necessary software to enable output data communications to a laboratory computer. Interface with the laboratory computer is provided through an ADAPTER BOX. All Single-Board units have the necessary software for the interface with a laboratory computer. Multi-Board units with version 10.7 software and above can have interface with a laboratory computer.



Multi-Board Configuration



Single-Board Configuration

A laboratory computer can use patient data and test results to make comparisons, display reports, and keep patient records.

IMPORTANT

The *DT60* ANALYZER can send data to, but cannot receive data from, a laboratory computer.

Components

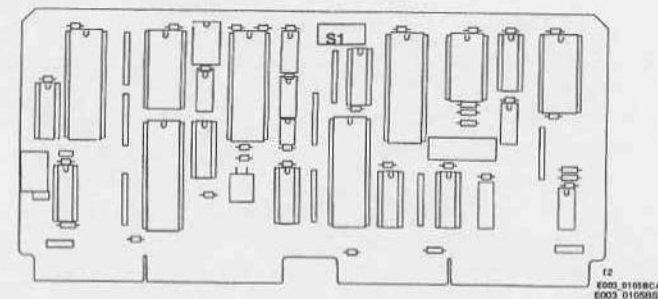
Multi-Board Configuration: CPU BOARD

I/O BOARD

Single-Board Configuration: MASTER BOARD

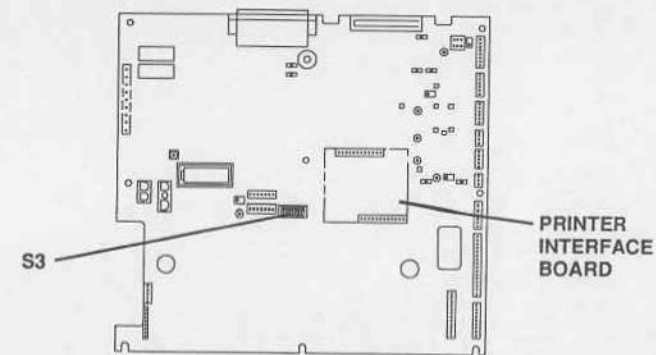
ADAPTER BOX

In Multi-Board units the positions of the DIP SWITCHES at "S1" on the I/O BOARD determine the serial communication protocol.



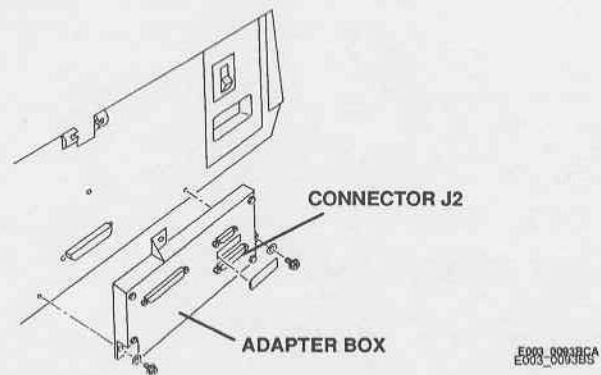
I/O BOARD

In Single-Board units, the DIP SWITCHES for setting the communication protocol are on the MASTER BOARD at "S3" adjacent to the PRINTER INTERFACE BOARD.



MASTER BOARD

The ADAPTER BOX has JUMPERS to set the configuration for either "DCE" or "DTE" communications. The ADAPTER BOX also has CONNECTORS for interface with a laboratory computer, the *DTE* MODULE, and the *DTSC* MODULE. The laboratory computer is connected at J2 on the ADAPTER BOX.



The software in the *DT60* ANALYZER has options to check the integrity of the internal circuits and the external circuits. For additional information about the laboratory computer interface, see the Options for the DT SYSTEM, section 4 in this service manual. See also the publication, "Specifications for Computer Interface". The publication is included in General Information for the *DT60* ANALYZER and the *DTE* MODULE, section 1 in this service manual.

Interface with the DTE MODULE

Function

The DT60 ANALYZER provides the power and all monitoring and control functions for the DTE MODULE through the MAIN POWER CABLE of the DTE MODULE.

Components

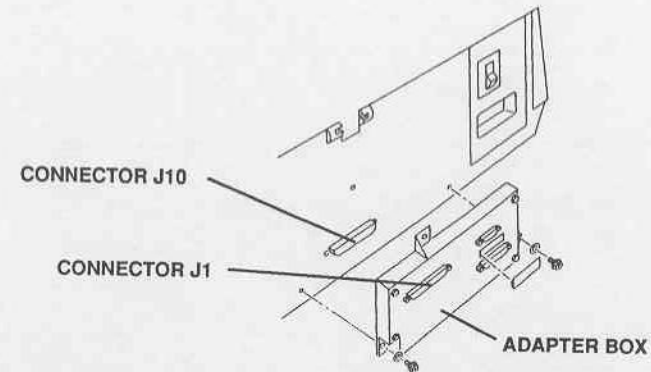
MAIN POWER CABLE on the DTE MODULE

Multi-Board Configuration: CPU BOARD and I/O BOARD

Single-Board Configuration: MASTER BOARD

ADAPTER BOX

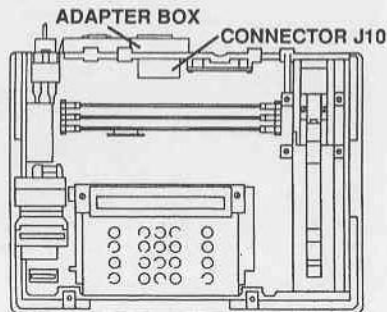
The interface between the DT60 ANALYZER and the DTE MODULE is provided through CONNECTOR J10 on the MOTHER BOARD in Multi-Board configuration, or through CONNECTOR J10 on the MASTER BOARD in Single-Board configuration. If the DT60 ANALYZER is connected to a laboratory computer or to the DTSC MODULE, then the ADAPTER BOX is connected to CONNECTOR J10, and the DTE MODULE is connected to the ADAPTER BOX at CONNECTOR J1.



E003_0083BGP
E003_0093BS

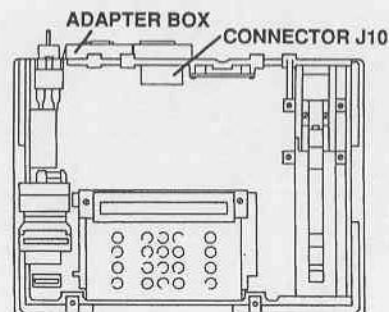
The DT60 ANALYZER monitors and controls, through the MAIN POWER CABLE, all operations of the DTE MODULE, including:

- temperature control
- mechanical movement of the ELECTROMETER
- electronic operation of the ELECTROMETER
- slide identification
- metering detection
- energizing the LED
- obtaining the readings
- calculating and displaying the results



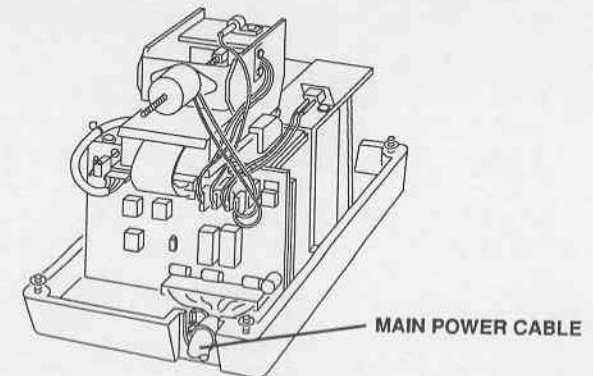
E003_0186ACB
E003_0186AS

Multi-Board Configuration



E003_0187ACB
E003_0187AS

Single-Board Configuration

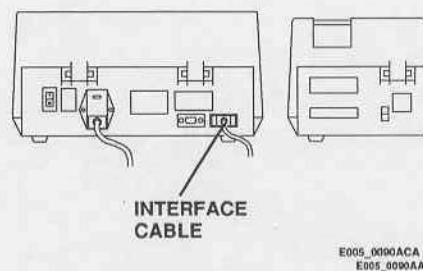


E004_0072BCF
E004_0072BC

Interface with the DTSC MODULE

Function

An INTERFACE CABLE provides bidirectional serial communication between the DT60 ANALYZER and the DTSC MODULE.



Components

INTERFACE CABLE

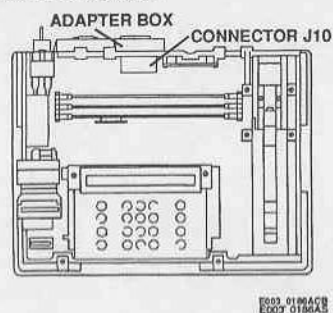
Multi-Board Configuration: MOTHER BOARD

Single-Board Configuration: MASTER BOARD

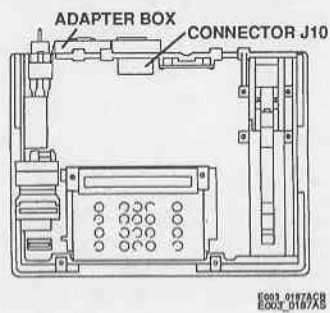
CONTROLLER BOARD in the DTSC MODULE

ADAPTER BOX

The interface between the DT60 ANALYZER and the DTSC MODULE is provided through CONNECTOR J10 on the MOTHER BOARD in Multi-Board configuration, or through CONNECTOR J10 on the MASTER BOARD in Single-Board configuration.

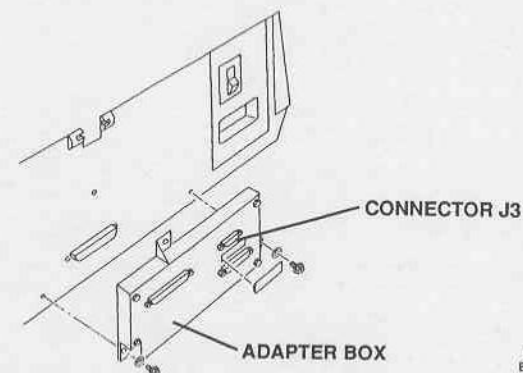


Multi-Board Configuration

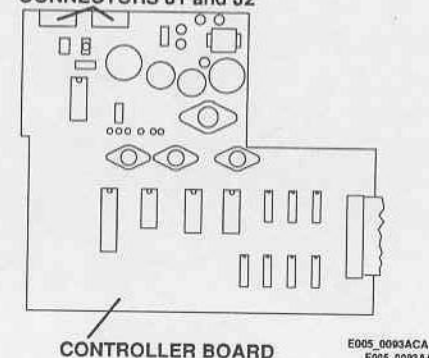


Single-Board Configuration

The ADAPTER BOX is connected to the DT60 ANALYZER at CONNECTOR J10. The INTERFACE CABLE connects between CONNECTOR J3 on the ADAPTER BOX and CONNECTOR J1 or CONNECTOR J2 on the CONTROLLER BOARD in the DTSC MODULE.



CONNECTORS J1 and J2



When options for the DTSC MODULE are executed, the DT60 ANALYZER sends commands through the INTERFACE CABLE to the CONTROLLER BOARD. The DT60 ANALYZER and the DTSC MODULE also exchange data through the INTERFACE CABLE:

- The DT60 ANALYZER sends slide processing data from ROM and RAM to the DTSC MODULE.
- The DTSC MODULE sends data about error conditions and slide readings, and signals from the BAR CODE READER and the SPOT DETECTOR SENSOR to the DT60 ANALYZER.

NRM_OP1.TXT and OP1_CVR.TXT
Publication No. XP3100-35, 5-90

Kodak, Ektachem, DT60, DTE, DTSC, and Estar are trademarks.

Customer Equipment Services

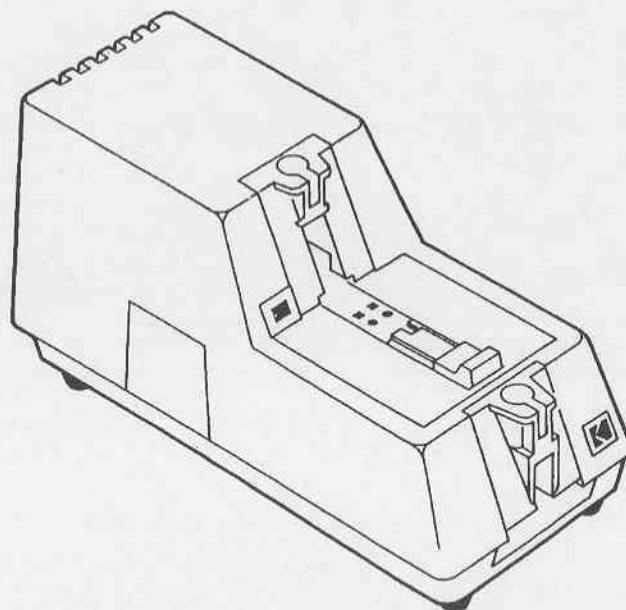
EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650



Printed in USA



Normal Operation
for the
Kodak Ektachem DTE MODULE
Section 3



E004_0034D1

PLEASE NOTE

The information contained herein is based on the experience and knowledge relating to the subject matter gained by Eastman Kodak Company prior to publication.

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Eastman Kodak Company reserves the right to change this information without notice, and makes no warranty, express or implied, with respect to this information. Kodak shall not be liable for any loss or damage, including consequential or special damages, resulting from the use of this information, even if loss or damage is caused by Kodak's negligence or other fault.

CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Slide Identification System.....	6
Slide Transport System.....	12
Metering System.....	14
Temperature Control System.....	18
Slide Reading System.....	22
CIRCUIT BOARDS.....	24

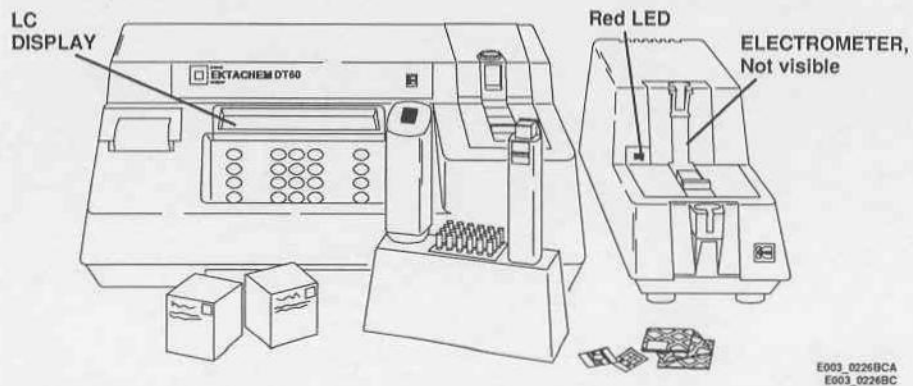
Initialization

Function

During initialization, the computer in the *DT60* ANALYZER checks the mechanical and electrical operation of the *DTE* MODULE before allowing slide tests to be processed.

Sequence of Operation

- [1] When the power is first applied, the red LED in the *DTE* MODULE energizes and remains energized until the RACKS in the *DT60* ANALYZER move to clear the INCUBATOR.
- [2] The red LED starts to flash and the ELECTROMETER moves toward the front of the *DTE* MODULE to the SPOTTING STATION.
- [3] The microprocessor in the *DT60* ANALYZER does an internal electrical checkout of the ELECTROMETER.
- [4] After the electrical checkouts, the ELECTROMETER moves back to the home-position.
- [5] When the ELECTROMETER reaches the home-position, the LC DISPLAY in the *DT60* ANALYZER displays the message: "DTE MODULE READY", and the red LED stops flashing and deenergizes.



Slide Identification System

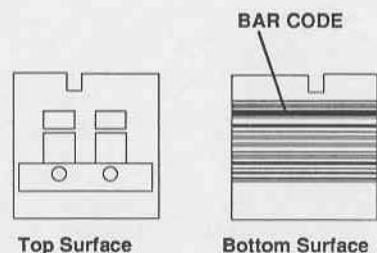
Function

The Slide Identification System for the *DTE* MODULE detects that a slide is inserted into the MODULE, and sends a signal to the computer in the *DT60* ANALYZER. When a slide is detected, the computer expects to receive an additional signal from the BAR CODE READER as the BAR CODE is scanned. The Slide Identification System decodes the information in the BAR CODE on the slide, and transfers the information to the computer. The data are compared with the data from the CLM, to determine if the slide is an acceptable chemistry. The slide data are also compared with data from the CDM and the NON-VOLATILE RAM to determine if the chemistry is calibrated for the generation of the slide lot.

Components

BAR CODES

Kodak Ektachem CLINICAL CHEMISTRY SLIDES have BAR CODES, a sequence of black and white lines that can be decoded to determine the chemistry name of the slide and the generation number of the emulsion. The BAR CODE is located on the bottom surface of the potentiometric slides.

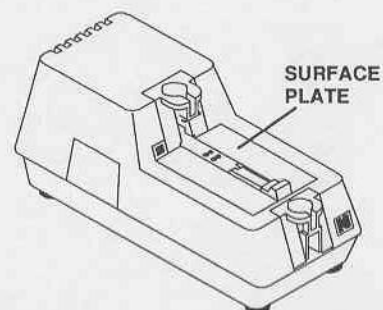


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E004_0062AC

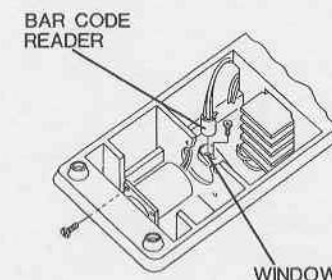
BAR CODE READER

In the *DTE* MODULE, the BAR CODE READER is installed under the SURFACE PLATE and is covered by a glass WINDOW. The 2 active components of the BAR CODE READER are:

- an LED (LIGHT EMITTING DIODE) that projects 2 beams of light
- a PHOTODIODE that receives the light reflected from the BAR CODE on the slide.



E004_0034ACB
E004_0034AC



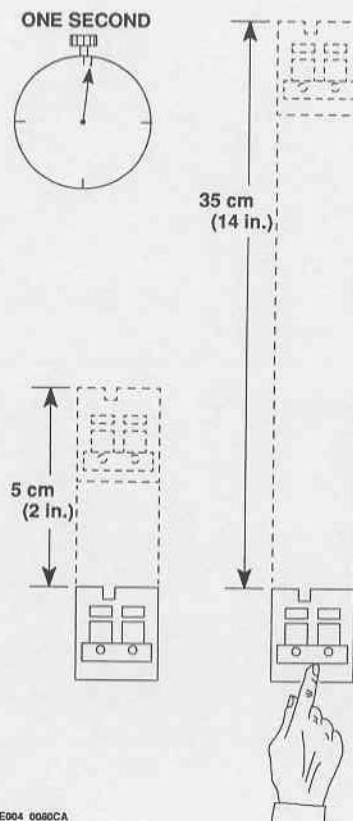
E004_0050ASC

The BAR CODE READER in the *DT60* ANALYZER can be adjusted for both focus and voltage, but the BAR CODE READER in the *DTE* MODULE can be adjusted only for voltage. The focus is set permanently. The voltage specification for the BAR CODE READER in the *DTE* MODULE is -5.25 to -5.75 V dc.

BAR CODE READER - Continued

The BAR CODE READER reads the slide when the operator inserts the slide manually with the SLIDE ADVANCE LEVER. The BAR CODE READER should be able to operate within normal insertion speeds, from 5 cm (2 in.) per second to 35 cm (14 in.) per second. Because this is a manual operation, exact measurement of the insertion speed is difficult.

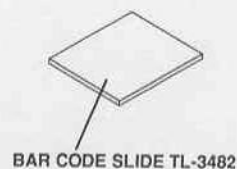
To estimate the slow insertion speed, measure 5 cm on a surface. Manually push a slide across that distance surface and count 1 second. To estimate the fast insertion speed, measure 35 cm and do the same procedure.



E004_0080CA

BAR CODE SLIDE TL-3482

This slide is a special tool used for adjusting the BAR CODE READER. It has no BAR CODE, and the white reflective surface provides a uniform white area that can be used to set the gain for the voltage signal within the adjustment specification.

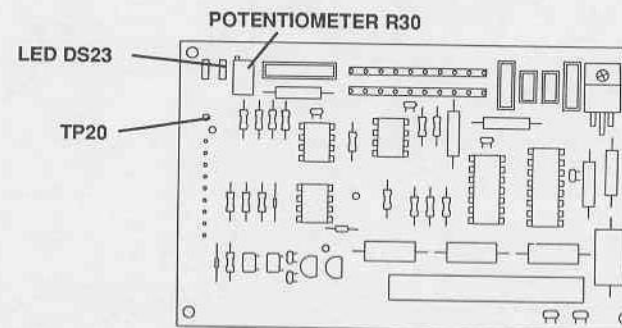


E002_0252ACB
E003_0252AA

INTERFACE BOARD

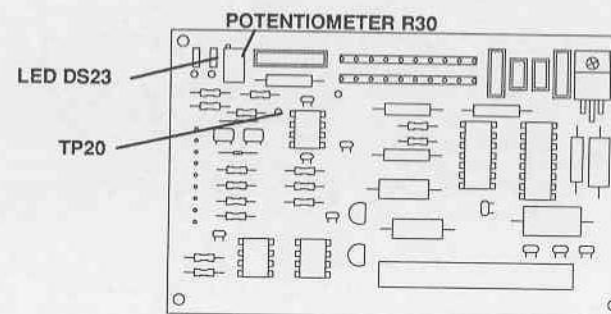
The following components on the INTERFACE BOARD, in the DTE MODULE, relate to slide identification:

- LED DS23 - flickers when the BAR CODE READER transmits a signal from the BAR CODE.
- POTENTIOMETER R30 - sets the gain for the signal from the BAR CODE.
- TEST POINT TP20 - provides a monitoring location for the voltage signal from the BAR CODE READER.



Type 1 INTERFACE BOARD

E004_0078BCF
E004_0078BC

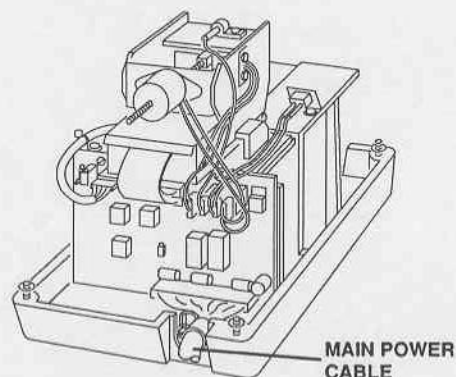


Type 2 INTERFACE BOARD

E004_0077BCF
E004_0077BC

MAIN POWER CABLE

The MAIN POWER CABLE, through CONNECTOR J10 on the MOTHER BOARD or the MASTER BOARD, provides power and data communication from the DT60 ANALYZER for the BAR CODE READER in the DTE MODULE.



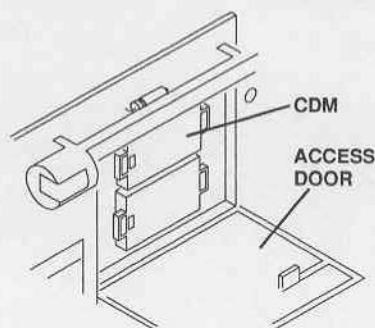
E004_0072BCD
E004_0072BC

CDM

The CALIBRATION DATA MODULE or CDM, located in the DT60 ANALYZER, has the necessary data for processing the tests. When the BAR CODE READER first reads the BAR CODE, the system checks the data in the CDM to determine if test data exist for the generation No. of the inserted slide. If no corresponding data exist in the CDM, the slide cannot be processed. Error messages will instruct the operator to remove the slide. For additional information about the CDM, see "Operating Instructions," section 2 in the Operator's Manual.

NOTE

To locate the CDM, open the ACCESS DOOR on the back of the DT60 ANALYZER.



E003_0076ACB
E003_0076AA

CDM/CLM BOARD In the DT60 ANALYZER

Sequence of Operation

- [1] The operator inserts the slide manually, using the SLIDE ADVANCE LEVER.
- [2] As an inserted slide moves into the SPOTTING STATION, the light beam from the BAR CODE READER detects the white edge of the slide, then scans the BAR CODE on the slide.
- [3] Some of the light is reflected from the slide down to the BAR CODE READER.
- [4] The BAR CODE READER then transmits a voltage signal corresponding to the amount of light reflected from the black and white lines in the BAR CODE.
- [5] The first lines in the BAR CODE allow the microprocessor to determine if the inserted slide is for a potentiometric test. The remainder of the BAR CODE allows the DT60 ANALYZER to identify the chemistry and the generation No. of the inserted slide.
- [6] The data from the BAR CODE are compared with the data available from the software.
In the processing mode, the chemistry data are compared with the data in the CLM, and the generation No. is compared with the data in the NON-VOLATILE RAM.
In the calibration mode, the chemistry data from the slide are compared with the data in the CLM and the generation No. is compared with the data in the CDM.
- [7] If the comparison of data is successful, the chemistry abbreviation, then "ID=", and the message "SPOT SLIDE WITH FLUID" are displayed in the LC DISPLAY.
- [8] If the slide cannot be fully identified, but the system reads the first 3 lines in the BAR CODE, the message "SLIDE NOT IDENTIFIED/SELECT TEST" is displayed.
The operator must press **chemistry select** until the correct test name is displayed with "ENTER SLIDE GENERATION".
Press the correct number keys for the generation No.
Then press **enter** to identify the chemistry and the generation No.
- [9] If the BAR CODE READER cannot read any lines in the BAR CODE, the message "DISCARD PM SLIDE AND REPEAT" is displayed. The operator must insert a new slide to discard the old slide.
- [10] The following conditions can prevent the identification of the slide:
 - The slide is inserted backwards or with the top surface down.
 - The inserted slide is not for a potentiometric test.
 - The slide was inserted too slow or too fast.
 - The BAR CODE READER is not adjusted correctly, or has a malfunction.
 - The WINDOW over the BAR CODE READER is dirty.
 - The circuit for the BAR CODE READER has a malfunction.

Slide Transport System

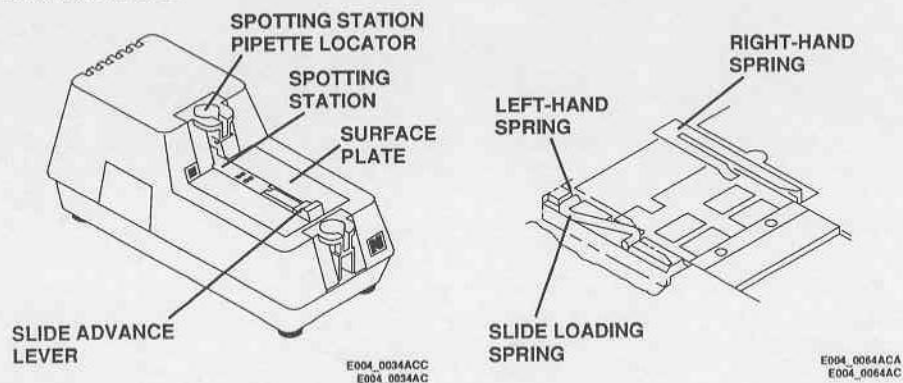
Function

The Slide Transport System in the DTE MODULE is fully manual. The SLIDE ADVANCE LEVER, together with the SURFACE PLATE and 3 SPRINGS on the TEMPERATURE CONTROL MODULE, places the slide in the correct position for metering and reading.

Components

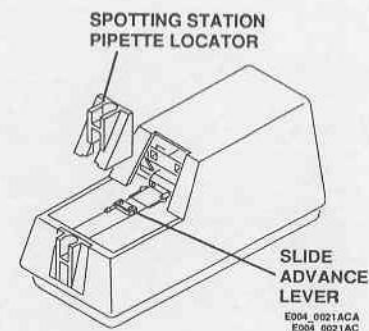
SLIDE ADVANCE LEVER
SPOTTING STATION PIPETTE LOCATOR
SURFACE PLATE
SPRINGS on the TEMPERATURE CONTROL MODULE

After loading a slide in the DTE MODULE, the operator pushes the SLIDE ADVANCE LEVER to move the slide to the SPOTTING STATION. Several mechanical parts work together to place the slide in the correct position for metering. The slide moves between the 2 sides of the SURFACE PLATE and under the RIGHT-HAND SPRING and the LEFT-HAND SPRING in the SPOTTING STATION. A SLIDE LOADING SPRING, located on the left side of the INCUBATOR, pushes the slide against the right side of the INCUBATOR. A notch on the bottom surface of the SPOTTING STATION PIPETTE LOCATOR stops the motion of the SLIDE ADVANCE LEVER and the slide.

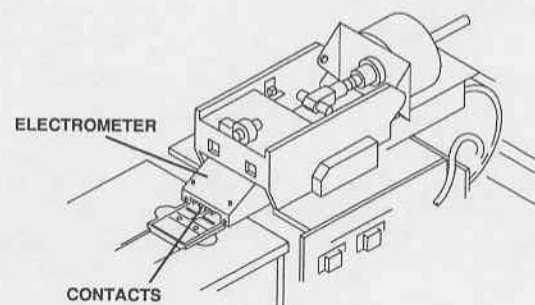


Sequence of Operation

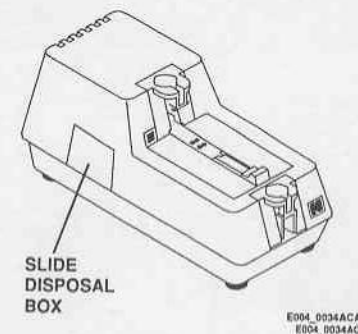
- [1] Slide transport is fully manual. The operator loads a potentiometric slide and uses the ADVANCE LEVER to move the slide to the SPOTTING STATION.
- [2] The SPOTTING STATION PIPETTE LOCATOR must be installed and seated correctly for correct slide registration.



- [3] The ELECTROMETER moves to place the CONTACTS on the slide for the reading.



- [4] The next slide pushes the previous slide into the SLIDE DISPOSAL BOX.



Metering System

Function

To provide, and place correctly on the slide, an accurate 10 μ L drop of each of the following:

- sample fluid
- Kodak Ektachem ELECTROLYTE REFERENCE FLUID

Components

Kodak Ektachem DTE PIPETTE TIPS

The Kodak Ektachem DTE PIPETTE aspirates sample fluid and reference fluid simultaneously and dispenses an accurate 10 μ L drop of each fluid onto the slide. **2 new disposable TIPS must be installed on the DTE PIPETTE before each aspiration.**

IMPORTANT

The DTE PIPETTE should remain in a vertical position during the aspirating and dispensing operations.

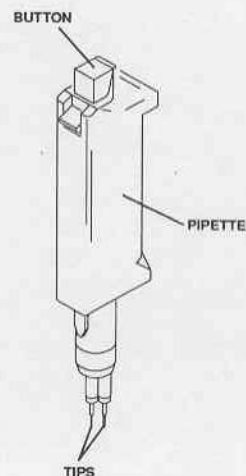
To aspirate the fluids, the operator:

- presses and holds the BUTTON,
- inserts the DTE PIPETTE down into the ASPIRATION STATION PIPETTE LOCATOR,
- slowly releases the BUTTON to aspirate the fluids, and
- removes the DTE PIPETTE from the ASPIRATION STATION PIPETTE LOCATOR.

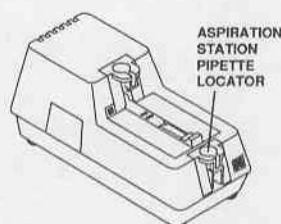
To dispense the fluids, the operator:

- inserts the PIPETTE into the SPOTTING STATION PIPETTE LOCATOR,
- presses and holds the BUTTON again to dispense the fluids, and
- continues to press the BUTTON while removing the PIPETTE from the PIPETTE LOCATOR.

A complete guide to the correct operating technique for the DTE PIPETTE is in the Operator's Manual.



E004_0050CA
E004_0050CC



E004_0054ACD
E004_0054AC

ASPIRATION STATION PIPETTE LOCATOR RESERVOIR HOLDER DUAL-SAMPLE CUP REFERENCE FLUID

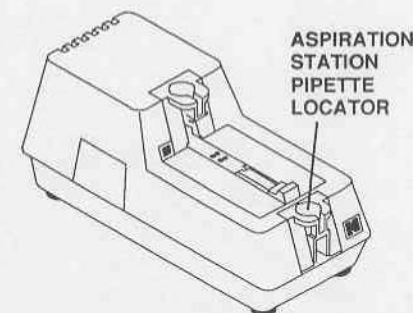
Kodak Ektachem DT ELECTROLYTE REFERENCE FLUID is necessary for potentiometric tests. The REFERENCE FLUID causes an electrical potential with a specific mV value to occur in one of the ION-SELECTIVE ELECTRODES. The sample fluid also causes an electrical potential in the other ION-SELECTIVE ELECTRODE. To obtain the test results, the electrical potential of the sample and the reference fluid are compared.

The metering system in the DTE MODULE has an ASPIRATION STATION to allow the operator to aspirate the sample fluid and the REFERENCE FLUID in equal volumes at the same time. For each patient sample, the operator uses a new DUAL-SAMPLE CUP. The DUAL-SAMPLE CUP has 2 WELLS. The operator dispenses sample fluid into the large WELL, and REFERENCE FLUID into the small WELL. The DUAL-SAMPLE CUP is placed into the RESERVOIR HOLDER, and the RESERVOIR HOLDER is moved to the closed position.

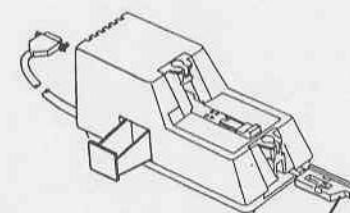
IMPORTANT

When the sample fluid and the REFERENCE FLUID are aspirated, the RESERVOIR HOLDER must be in the closed position, and the DTE PIPETTE must be inserted through the ASPIRATION STATION PIPETTE LOCATOR.

The ASPIRATION STATION PIPETTE LOCATOR provides a precise and stable position for the DTE PIPETTE during the aspiration operation. To aspirate the fluids, the operator presses the BUTTON and inserts the DTE PIPETTE down into the hole in the top of the ASPIRATION STATION PIPETTE LOCATOR. For additional information about using the DTE PIPETTE, see the Operator's Manual.

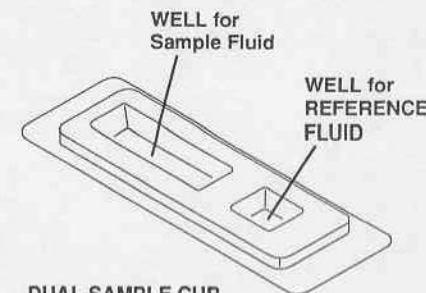


E004_0034ACD
E004_0034AC



RESERVOIR HOLDER

E004_0072ACA
E004_0072AS

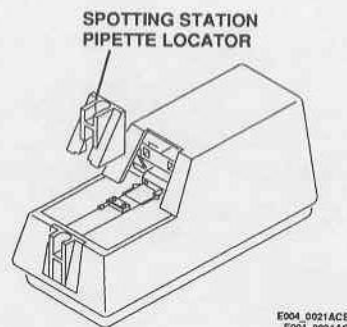


DUAL-SAMPLE CUP

E004_0004ACA
E004_0004AC

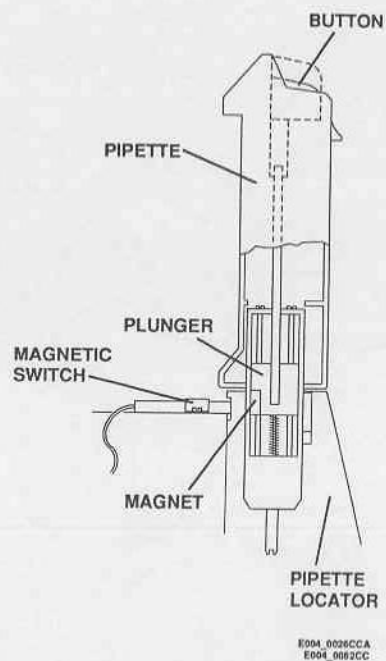
SPOTTING STATION PIPETTE LOCATOR

The SPOTTING STATION PIPETTE LOCATOR provides a precise and stable position for the DTE PIPETTE during the dispensing operation. To dispense the fluids, the operator inserts the DTE PIPETTE down into the hole in the top of the SPOTTING STATION PIPETTE LOCATOR. When the DTE PIPETTE is seated in the PIPETTE LOCATOR, the operator presses the BUTTON to dispense the fluids. For additional information about using the DTE PIPETTE, see the Operator's Manual.



MAGNETIC SWITCH

A MAGNETIC SWITCH is installed in the DTE MODULE to detect the actuations of the DTE PIPETTE. When the operator presses the BUTTON to dispense the fluids, a MAGNET moves down with the PLUNGER. The MAGNET causes the MAGNETIC SWITCH to close and send a voltage signal to the DT60 ANALYZER. When the microprocessor in the DT60 ANALYZER receives the signal, the beep tone occurs. Then, the computer executes a command signal to start the LINEAR ACTUATOR. The LINEAR ACTUATOR moves the ELECTROMETER to the slide for the reading.



Temperature Control System

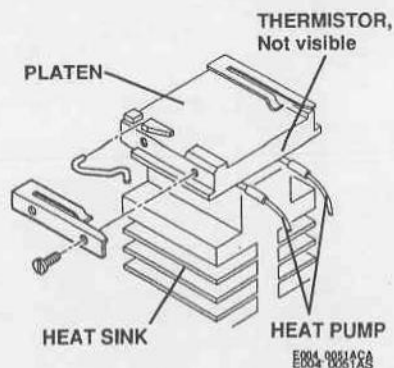
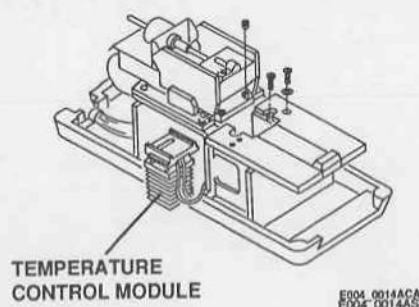
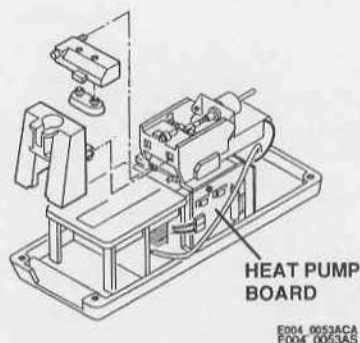
Function

The Temperature Control System operates to obtain a temperature range of 24.20° to 25.80° C (75.5° to 78.5° F) in the INCUBATOR before the ELECTROMETER reads the slide, and to keep the INCUBATOR within that range until the reading is completed. The DTE MODULE has a "set point" of 25.00° C (77.0° F) that cannot be adjusted.

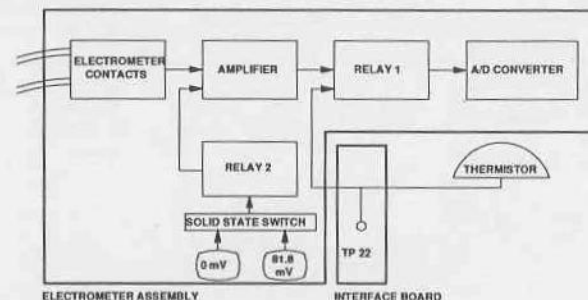
Components

TEMPERATURE CONTROL MODULE, includes:
HEAT PUMP
THERMISTOR
HEAT SINK
PLATEN

The TEMPERATURE CONTROL MODULE is controlled by the HEAT PUMP BOARD and monitored by the microprocessor in the DT60 ANALYZER, through the ELECTROMETER. At the top of the TEMPERATURE CONTROL MODULE, level with the slide path, is a PLATEN. The slide is moved manually onto the PLATEN for the slide reading. The TEMPERATURE CONTROL MODULE has a HEAT PUMP that can heat or cool. The HEAT PUMP is installed under the PLATEN, and the PLATEN is heated or cooled by conduction. A THERMISTOR monitors the temperature of the PLATEN. A HEAT SINK provides for cooling of the TEMPERATURE CONTROL MODULE.



RELAY 1 in the ELECTROMETER allows the ELECTROMETER to alternate between reading the slides and reading the temperature of the PLATEN. RELAY 1 can connect either of 2 signals to the A/D CONVERTER. For temperature control, RELAY 1 selects the signal from the THERMISTOR. When the THERMISTOR is selected, the SLIDE CONTACTS, through the AMPLIFIER, are disconnected from the A/D CONVERTER. During this temperature control phase, the A/D CONVERTER receives only the voltage from the THERMISTOR. Voltage from the THERMISTOR can be measured at TP22 on the INTERFACE BOARD. See the following diagram.



A SWITCH in RELAY 1 receives the output dc voltage signal from the THERMISTOR. The A/D CONVERTER changes the dc voltage to A/D units and sends the signal to the microprocessor in the DT60 ANALYZER.

After the MAGNETIC SWITCH detects the actuation of the DTE PIPETTE, the microprocessor in the DT60 ANALYZER checks the A/D signal from RELAY 1. The A/D value is compared with the temperature limits in the software, and the microprocessor selects the correct flow of current through the HEAT PUMP to cause heating or cooling, as necessary.

IMPORTANT

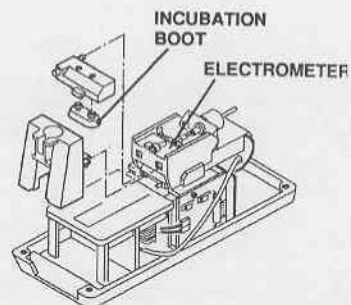
The temperature control phase is 180 seconds in the U.S., and 90 seconds in other locations.

The HEAT PUMP heats continually or cools continually during the temperature control phase. The purpose of the heating or the cooling is to allow the temperature of the PLATEN and the slide to reach $25^{\circ}\text{C} \pm 0.8^{\circ}$ before the reading occurs. The microprocessor checks the A/D signal from RELAY 1 again, 5 seconds before the completion of the temperature control phase. If the temperature value is within the error limits of 24.20° to 25.80°C , or 2975 to 2830 A/D units, 5 seconds later, RELAY 1 disconnects the THERMISTOR from the A/D CONVERTER and connects the ELECTROMETER CONTACTS to the A/D CONVERTER for the slide reading.

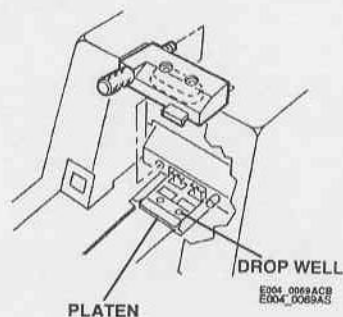
If the value for the temperature is not within the error limits, an error code occurs and the message "NO RESULTS" is displayed on the printout.

INCUBATION BOOT

The INCUBATION BOOT is installed on the NOSE ASSEMBLY of the ELECTROMETER, and it provides a stable environment for the drops on the slide. When the ELECTROMETER is moved to the reading position, the INCUBATION BOOT covers and seals the 2 DROP WELLS on the potentiometric slide. The closed area under the INCUBATION BOOT, together with the PLATEN and the slide, form an INCUBATOR CHAMBER that inhibits evaporation. Evaporation can occur more rapidly when the fluid is heated to more than the room temperature, especially if the air is dry.



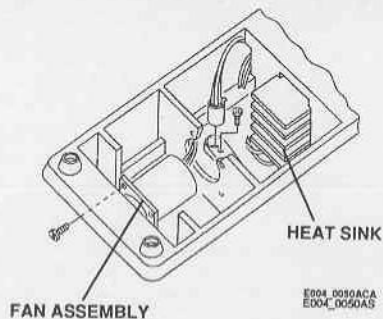
E004_003ACB
E004_0053AS



E004_0069ACB
E004_0069AS

FAN ASSEMBLY

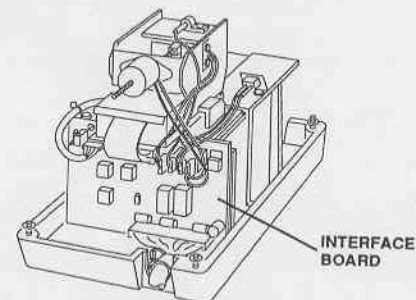
When the HEAT PUMP operates in the cooling mode, the FAN ASSEMBLY is actuated to pull air from the room across the HEAT SINK. Any excessive heat in the TEMPERATURE CONTROL MODULE is removed faster by the moving air.



E004_0030ACA
E004_0050AS

INTERFACE BOARD

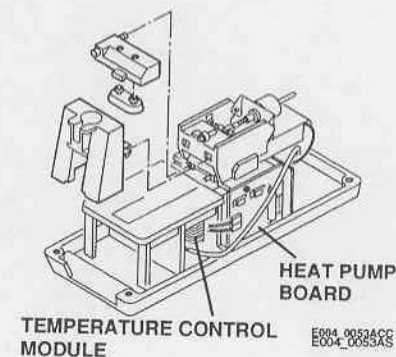
The INTERFACE BOARD transmits the heating and cooling signals in A/D units from the DT60 ANALYZER to the HEAT PUMP BOARD.



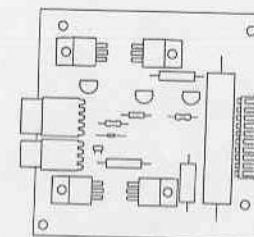
E004_0072BCE
E004_0072BC

HEAT PUMP BOARD

The HEAT PUMP BOARD provides voltage to and controls the TEMPERATURE CONTROL MODULE. The HEAT PUMP BOARD also receives command signals for heating or cooling from the DT60 ANALYZER. If a heating signal is received, the heating circuit for the HEAT PUMP is actuated. If a cooling signal is received, the cooling circuits for the HEAT PUMP and the FAN are actuated.



E004_0053ACG
E004_0053AS



HEAT PUMP BOARD

E004_0001BCA
E004_0001BC

Slide Reading System

Function

The ELECTROMETER is a sensitive digital VOLT-METER with a very high input impedance. Each potentiometric slide has 2 ELECTRODES. The slide reading system allows the ELECTROMETER to measure the potential difference between the 2 ELECTRODES of a potentiometric slide when a 10 μ L drop of sample fluid is placed in one DROP WELL and a 10 μ L drop of reference fluid is placed in the other DROP WELL.

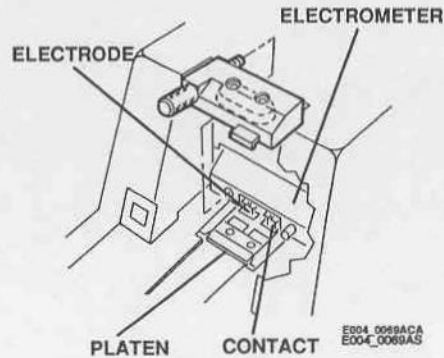
Components

ELECTROMETER

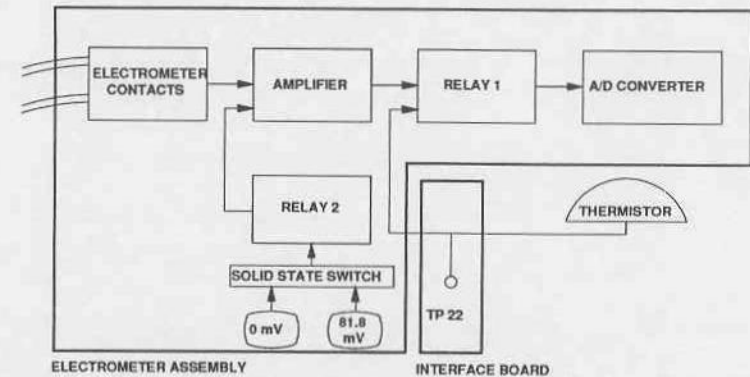
PLATEN

ELECTRODES on the Potentiometric Slide

The Slide Reading System includes the ELECTROMETER, the PLATEN of the TEMPERATURE CONTROL MODULE, and the ELECTRODES on the slides. The PLATEN provides a flat, stable surface for the slide. The temperature of the PLATEN is monitored and controlled. The moving ELECTROMETER places the ELECTROMETER CONTACTS in a precise position on the ELECTRODES of the potentiometric slide.



RELAY 1 in the ELECTROMETER allows the ELECTROMETER to alternate between reading the temperature of the PLATEN and reading the slides. RELAY 1 can connect either of 2 signals to the A/D CONVERTER. For slide reading, RELAY 1 selects the signals from the 4 ELECTROMETER CONTACTS. When the CONTACTS are selected, the THERMISTOR, through the AMPLIFIER, is disconnected from the A/D CONVERTER. During this slide reading phase, the A/D CONVERTER receives only the voltage from the CONTACTS. See the following diagram.



E003_0213BC

For each slide, the ELECTROMETER makes 3 consecutive readings each of:

- the Internal reference voltage
- the Internal offset voltage
- the external voltage of the slide through the CONTACTS

The A/D CONVERTER in the ELECTROMETER changes these voltages to A/D units. The computer in the DT60 ANALYZER receives the voltage signals in A/D units for a calculation.

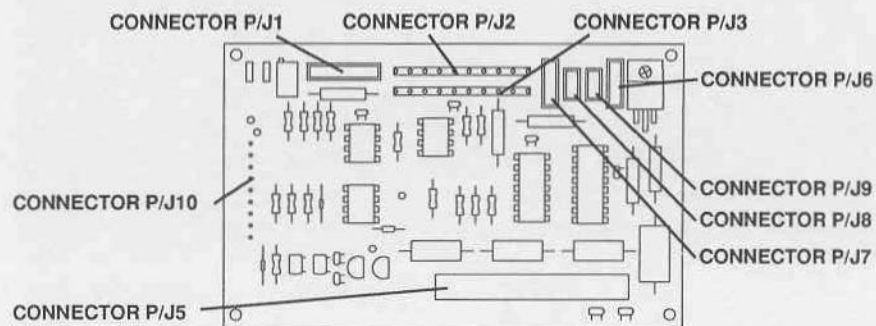
The ELECTROMETER also provides A/D conversion for voltages from the THERMISTOR in the TEMPERATURE CONTROL MODULE. See the section, "Temperature Control System", for additional information about the THERMISTOR.

CIRCUIT BOARDS

INTERFACE BOARD

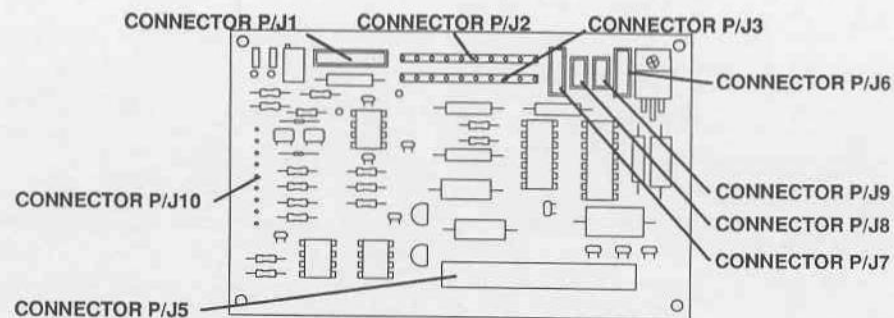
The INTERFACE BOARD provides the following for the DTE MODULE:

- CONNECTOR P1, the circuits, and the signal path for the BAR CODE READER
- CONNECTORS P/J2 and P/J3, the power, and the data bus path for the ELECTROMETER
- CONNECTOR P5 for the INTERFACE CABLE
- CONNECTOR P6 and the drive circuits for the LINEAR ACTUATOR
- CONNECTOR J7, the circuits, and signal path for the HOME SENSOR
- CONNECTOR P/J8 and the signal path for the MAGNETIC SWITCH
- the circuit path for the THERMISTOR from the ELECTROMETER to the HEAT PUMP BOARD
- CONNECTOR J9 and the signal path for the FRONT PANEL LED
- CONNECTOR P10 for the HEAT PUMP BOARD
- a path for +5 V dc and +15 V dc
- through Q1 and Q2, +12 V dc and -12 V dc
- the signal path for the heating and cooling commands from the DT60 ANALYZER to the HEAT PUMP BOARD
- the circuit path for the actuation of the FAN



Type 1 INTERFACE BOARD

E004_0078BCG
E004_0078BC



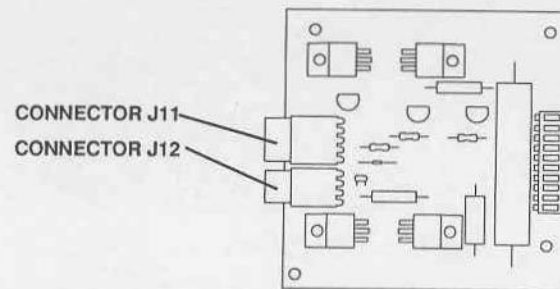
Type 2 INTERFACE BOARD

E004_0077BCG
E004_0077BC

HEAT PUMP BOARD

The HEAT PUMP BOARD provides the following for the DTE MODULE:

- CONNECTOR J11 for the TEMPERATURE CONTROL MODULE, including the HEAT PUMP and the THERMISTOR
- CONNECTOR J12 for the FAN
- CONNECTOR J10 to the INTERFACE BOARD



HEAT PUMP BOARD

E004_0081BCB
E004_0081BC

NRM_OP2.TXT and OP2_CVR.TXT
Publication No. XP3100-35, 4-90

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Publication No. XP3100-9

2/88

Supersedes XP3100-9, 9/87

XP3111-3, 2/86

Kodak Ektachem DT SYSTEM

Options for Software Versions 9.0, 10.7, and 11.0

Section 4

PLEASE NOTE

The information contained herein is based on the experience and knowledge relating to the subject matter gained by Eastman Kodak Company prior to publication.

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..... CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Kodak Ektachem DT System

Options for Software Versions 9.0, 10.7, and 11.0

Section 4

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Section 4. Options

The Function of Options

Options are functions or measurements that enable the user to determine if equipment operates correctly. Some options are also used to retrieve data from memory or to store data in memory.

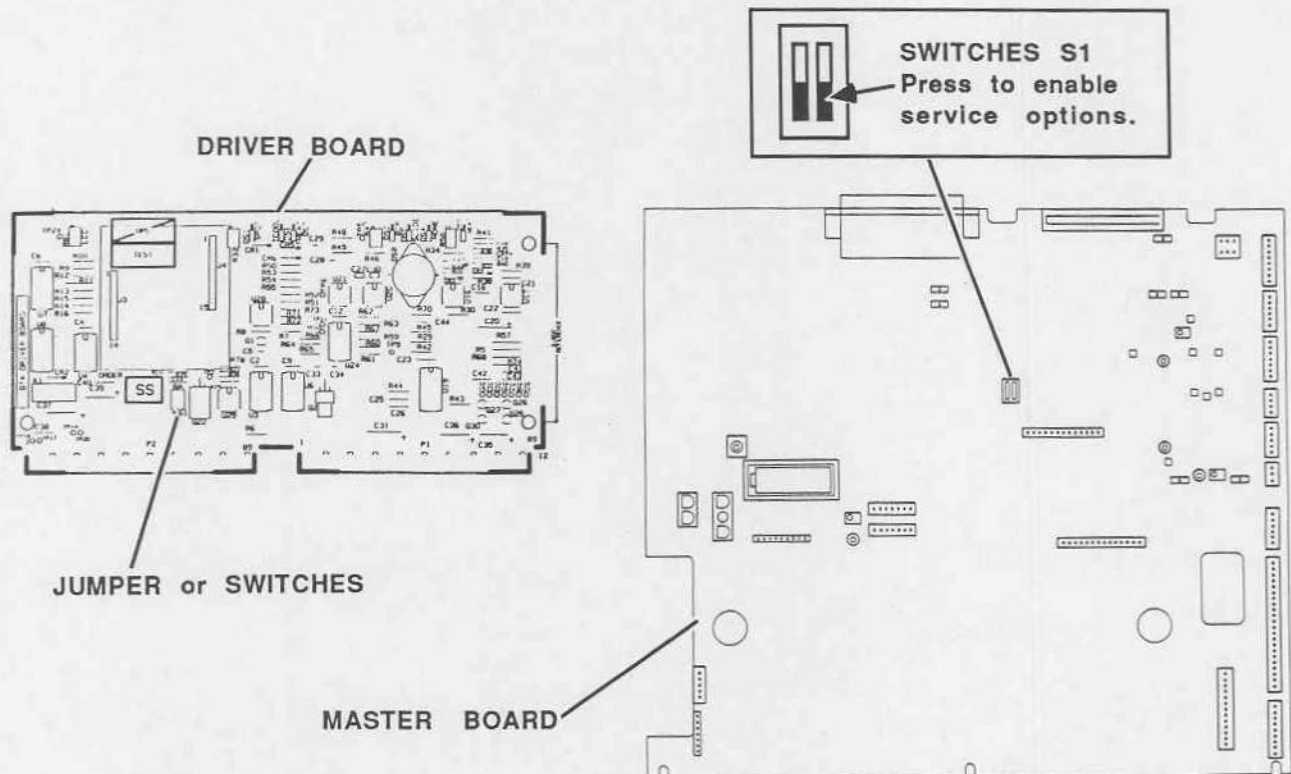
To execute options, you must first enter the **Service Mode**:

- Press "shift".
- Press "service mode".
- The message "ENTER OPTION NO." is displayed.
- Enter the number of the option you want to execute.

You cannot enter the Service Mode when the *DT60* Analyzer is processing samples. Wait until all samples are processed before executing options.

The *DT60* Analyzer must first be in the Run Mode before entering the Service Mode. If the *DT60* Analyzer is in Calibration Mode, complete or cancel the operation. Wait until all slides in the INCUBATOR have been processed. The last slide will remain in the Read Station. Then press the "cal mode" key to return to the Run Mode before you enter the Service Mode.

Service options are options used by the FE for advanced diagnostics. To use service options, the DRIVER BOARD or MASTER BOARD must be set for access. Some DRIVER BOARDS have a JUMPER, which must be removed to allow access to service options. Newer DRIVER BOARDS have SWITCHES which must be moved down to the "ON" position to allow access to service options. The MASTER BOARD has SWITCHES in the "S1" position that must be set to provide access.



Section 4. Options

In software versions 9.0 and 10.7, a blinking "S" is displayed in the bottom right corner of the LC DISPLAY when service options are available. The feature is not included in software version 11.0.



Normally, the Analyzer should always be set to allow access to service options. A customer could try to use service options to disable the diagnostic software, for example, by executing option 70 to disable the temperature monitoring function. If this occurs, the FE can move the SWITCHES to prevent access to the service options. The district service manager should be informed of this decision.

The following description of the options has more information about each of the options:

- The number of the option.
- The type of option:
 - The primary equipment related to the option – **DT60 Analyzer**, **DTE Module**, or **DTSC Module**.
 - If an option is a service option, it is labelled "**Service**".
 - The other options are labelled "**Customer**", because these could be used by customers, and may also be described in the Operator's Manual.
- A description of the option, including the function of the option, and information about executing the option.
- Options are not the same in all 3 versions of software. Some options are found only in certain software versions, and some options may have different functions in the different versions. The information in the description will indicate where there is a difference.

Section 4. Options

Option	Type	Description
0	DT60 Customer	<p>Cancels certain options that were selected previously.</p> <p>Cancels options 1, 2, 6, 7, 8, 14, 31, 75, 76, and 94.</p>
1	DT60 Customer	<p>Advances the UPPER RACK.</p> <p>This option moves the UPPER RACK ASSEMBLY from the home•position to transfer the slide to the INCUBATOR. If the UPPER RACK is not at home•position when option 1 is entered, the message "RUN OPTION 0 FIRST" is displayed. Cancel with option 0.</p>
2	DT60 Customer	<p>Advances the LOWER RACK to the WHITE REFERENCE position.</p> <p>Moves the WHITE REFERENCE from the home•position to a position above the FORS ASSEMBLY. Then moves the slide from the INCUBATOR to the Read Station. The WHITE REFERENCE is above the FORS HEAD. If the LOWER RACK is not at home•position when option 2 is entered, the message "RUN OPTION 0 FIRST" is displayed. Cancel with option 0.</p>
3	DT60 Customer	<p>Operates the TRANSPORT MECHANISM in the Analyzer.</p> <p>Allows the user to operate the TRANSPORT MECHANISM 1 to 99 times.</p>
4	DT60 Customer	<p>Checks the operation of the PRINTER by printing all available characters.</p> <p>If the PRINTER does not respond, the message "PRINTER FAILURE" is displayed.</p>
5	DT60 Customer	<p>Checks the operation of the LC DISPLAY.</p> <p>Energizes the LC DISPLAY, and displays the character matrix used to write all characters on the LC DISPLAY.</p>
6	DT60 Customer	<p>Energizes the green LED in the FORS ASSEMBLY.</p> <p>This option is cancelled only by options 0, 7, or 8.</p>
7	DT60 Customer	<p>Energizes the red LED in the FORS ASSEMBLY.</p> <p>This option is cancelled only by options 0, 6, or 8.</p>

Section 4. Options

Option	Type	Description																																																																		
8	DT60 Customer	<p>Energizes the yellow LED in the FORS ASSEMBLY.</p> <p>This option is cancelled only by options 0, 6, or 7.</p>																																																																		
9	DT60 Customer	<p>Checks the RAM memory.</p> <p>Checks RAM memory and then initializes the DT60 Analyzer. If the RAM operates correctly, the message "RAM MEMORY TEST-OK" is displayed, and the Analyzer is initialized. If a malfunction occurs, the printout provides the following messages to identify the component which has the malfunction:</p> <table> <tr> <th colspan="3">Software Version 9.0</th></tr> <tr> <th><u>Designation on printout</u></th><th><u>Function</u></th><th><u>Location</u></th></tr> <tr> <td>1</td><td>Software PROM 1</td><td>U1 on CPU BOARD</td></tr> <tr> <td>2</td><td>Software PROM 2</td><td>U2 on CPU BOARD</td></tr> <tr> <td>3</td><td>Software PROM 3</td><td>U3 on CPU BOARD</td></tr> <tr> <td>4</td><td>Software PROM 4</td><td>U4 on CPU BOARD</td></tr> <tr> <td>5</td><td>Software PROM 5</td><td>U5 on CPU BOARD</td></tr> <tr> <td>C</td><td>Half of CLM</td><td>CLM</td></tr> <tr> <td>R</td><td>Nonvolatile RAM</td><td>U8 on CPU BOARD</td></tr> </table> <table> <tr> <th colspan="3">Software Version 10.7</th></tr> <tr> <td>1</td><td>Software PROM 1</td><td>U1 on CPU BOARD</td></tr> <tr> <td>2</td><td>Software PROM 2</td><td>U2 on CPU BOARD</td></tr> <tr> <td>C</td><td>Half of CLM</td><td>CLM</td></tr> <tr> <td>D</td><td>Half of CLM</td><td>CLM</td></tr> <tr> <td>R</td><td>Nonvolatile RAM</td><td>U12 on CPU BOARD</td></tr> </table> <table> <tr> <th colspan="3">Software Version 11.0</th></tr> <tr> <td>1</td><td>Software PROM 1</td><td>U1 on CPU BOARD or U6 on MAIN CIRCUIT BOARD</td></tr> <tr> <td>2</td><td>Software PROM 2</td><td>U2 on CPU BOARD or U14 on MAIN CIRCUIT BOARD</td></tr> <tr> <td>C</td><td>Half of CLM</td><td>CLM</td></tr> <tr> <td>D</td><td>Half of CLM</td><td>CLM</td></tr> <tr> <td>M</td><td>CDM</td><td>CDM</td></tr> <tr> <td>R</td><td>Battery-Backed Up RAM</td><td>U12 on CPU BOARD or U36 on MAIN CIRCUIT BOARD</td></tr> </table>	Software Version 9.0			<u>Designation on printout</u>	<u>Function</u>	<u>Location</u>	1	Software PROM 1	U1 on CPU BOARD	2	Software PROM 2	U2 on CPU BOARD	3	Software PROM 3	U3 on CPU BOARD	4	Software PROM 4	U4 on CPU BOARD	5	Software PROM 5	U5 on CPU BOARD	C	Half of CLM	CLM	R	Nonvolatile RAM	U8 on CPU BOARD	Software Version 10.7			1	Software PROM 1	U1 on CPU BOARD	2	Software PROM 2	U2 on CPU BOARD	C	Half of CLM	CLM	D	Half of CLM	CLM	R	Nonvolatile RAM	U12 on CPU BOARD	Software Version 11.0			1	Software PROM 1	U1 on CPU BOARD or U6 on MAIN CIRCUIT BOARD	2	Software PROM 2	U2 on CPU BOARD or U14 on MAIN CIRCUIT BOARD	C	Half of CLM	CLM	D	Half of CLM	CLM	M	CDM	CDM	R	Battery-Backed Up RAM	U12 on CPU BOARD or U36 on MAIN CIRCUIT BOARD
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10	DT60 Customer	<p>Checks the PROM memory.</p> <p>Calculates the checksum for each of the appropriate PROMS and RAM and compares the values to the stored values. The printout indicates the numbers of the EPROMS with malfunctions.</p>																																																																		

Section 4. Options

Option	Type	Description																																												
11	DT60 Customer	<p>Displays measurements in use.</p> <p>The measurements are "U.S." or "S.I.". "S.I." is "Standard International", or metric measurements. Also gives the status of urea nitrogen selected with options 92 and 93.</p> <p>Use option 63 to select U.S. measurements. Use option 64 to select S.I. measurements.</p>																																												
12	DT60 Customer	<p>Makes a printout of the last 64 characters entered.</p> <table><tr><th>Character on printout</th><th>Character entered on KEYBOARD</th></tr><tr><td>=</td><td>shift</td></tr><tr><td>..</td><td>clear</td></tr><tr><td>R</td><td>complete</td></tr><tr><td>I</td><td>patient ID</td></tr><tr><td>E</td><td>enter</td></tr><tr><td>S</td><td>chemistry select</td></tr><tr><td>C</td><td>cal mode</td></tr><tr><td>P</td><td>print</td></tr><tr><td>=R</td><td>in progress</td></tr><tr><td>=S</td><td>delete test</td></tr><tr><td>=C</td><td>service mode</td></tr><tr><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td></tr><tr><td>2</td><td>2</td></tr><tr><td>3</td><td>3</td></tr><tr><td>4</td><td>4</td></tr><tr><td>5</td><td>5</td></tr><tr><td>6</td><td>6</td></tr><tr><td>7</td><td>7</td></tr><tr><td>8</td><td>8</td></tr><tr><td>9</td><td>9</td></tr></table>	Character on printout	Character entered on KEYBOARD	=	shift	..	clear	R	complete	I	patient ID	E	enter	S	chemistry select	C	cal mode	P	print	=R	in progress	=S	delete test	=C	service mode	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
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13	DT60 Customer	<p>Displays software version number and CDM format number.</p> <p>Use option 53 to display the software version used in the <i>DTSC</i> Module.</p>																																												
14	DT60 Customer	<p>Provides A/D values on the printout with test results.</p> <p>A/D values are included on the printout with the test result in the "run mode", "cal mode", or "service mode". Cancel with option 0.</p>																																												
16	DT60 Customer	<p>Indicates the A/D values for the LOWER RACK.</p> <p>Allows the user to move the LOWER RACK for a selected number of steps and read the A/D values at each step for a selected LED color.</p> <ul style="list-style-type: none">• Select the LED color: green = 6, red = 7, yellow = 8, no LED = 9.• Enter the step count: -255 to +255 steps• Enter the number of readings: 1 to 99 readings• The readings are made.• The results are printed.																																												

Section 4. Options

Option	Type	Description
17	DT60 Customer	<p>Enters a date to be included on the printout.</p> <p>Allows the user to enter the date for the patient data. This date will be on the printout with the test results.</p>
18	DT60 Customer	<p>Displays colorimetric incubation countdown.</p> <p>When this option is enabled, the amount of time remaining for slides in the INCUBATOR is displayed. If another message is displayed on line 2 of the LC DISPLAY, the time display will be interrupted. Denergize the Analyzer to delete this option.</p> <p style="text-align: center;">IMPORTANT</p> <p>When option 18 is enabled, the "DTSC READY" message cannot be displayed. If a DTSC Module is installed, using option 18 is not recommended.</p>
19	DT60 Customer	<p>Checks the handshake communication between the DT60 Analyzer and the customer's computer.</p> <p>This option sends sample test results through the SERIAL COMMUNICATIONS PORT, similar to normal test results. The first message displayed is "SERIAL COMMUNICATIONS TEST". After the sample test results are transferred, the next message displayed will be one of the following 3 messages, depending on the result of the option:</p> <ul style="list-style-type: none">• "TEST OK" <p>This message is displayed when the record was transferred successfully and a 6-byte response signal, either "ACK" or "NAK", was received from the customer's computer.</p> <ul style="list-style-type: none">• "UNABLE TO TRANSMIT" <p>This message is displayed when the serial communication component on the I/O BOARD did not receive the CTS signal, and was not able to transfer any bytes of the record. A malfunction exists in the I/O BOARD. Execute option 21 to obtain more information on the malfunction.</p> <ul style="list-style-type: none">• "NO RESPONSE FROM PC" <p>This message is displayed when the data was successfully transferred but no response was received from the customer's computer. The computer is not operating or has a malfunction. Execute option 20 to obtain more information on the malfunction.</p>

Section 4. Options

Option	Type	Description
20	DT60 Customer	<p>Executes a data interface loopback test.</p> <p>This option is an external loopback test.</p> <ul style="list-style-type: none">• Connect the SERIAL LOOPBACK CONNECTOR TL-3225 to the RS232 PORT.• The message "DATA INTERFACE LOOPBACK TEST" is displayed.• All the binary values for the numbers 0 to 255 are sent as output from the ADAPTER PORT.• The SERIAL LOOPBACK CONNECTOR TL-3225 returns the data to the port.• If all the numbers are returned successfully the message "TEST OK" is displayed.• If all the numbers are not returned successfully, the message "TEST FAILS" is displayed. This response might indicate a malfunction in the ADAPTER BOARD.
21	DT60 Customer	<p>Executes an internal loopback test for the ADAPTER BOARD.</p> <p>This option executes an internal loopback test for the serial communications component.</p> <ul style="list-style-type: none">• Option 21 places the USART component on the I/O BOARD or MASTER BOARD in a special mode to return output port data to the input port.• The message "INTERNAL/EXTERNAL LOOPBACK TEST" is displayed.• All the binary values for the numbers 0 to 255 are sent as data from the output port of the USART component.• If all the numbers are returned successfully to the input port, the message "TEST OK" is displayed.• If all the numbers are not returned successfully, the message "TEST FAILS" is displayed. This response indicates a malfunction in the USART component on the I/O BOARD.
22	DT60 Customer	<p>Reports NH3 with CREA.</p> <p>To delete this option, initialize the <i>DT60</i> Analyzer again.</p>
29	DT60 Customer	<p>Calculates DR and new correction factors, and revises selected reflectance values.</p> <p>Option 29 is found only in software version 11.0. It provides an automatic procedure for calculating correction factors. This option will also provide a printout of DR values without a correction factor calculation. See the Correction Factors and DR Procedures in Section 9 for information on using option 29 in these procedures. Option 29 automatically performs the functions of option 14, by providing A/D values. It also reduces the incubation time to 39 seconds, as if option 60 had been executed. When option 29 is completed, the A/D values are no</p>

Section 4. Options

Option Type	Description
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longer reported, and an incubation time of 313 seconds is restored.

- The first message displayed is "SELECT LONG FORM". The long form provides mean and standard deviation in the results. Press the "chemistry select" key to display "YES" or "NO" on the LC DISPLAY. If you want the long form, press the "enter" key when "YES" is displayed.
- The next message is "SELECT DR CHECK". Again, press the "chemistry select" key to display "YES" or "NO", and press "enter" for the alternative you want. If you select "YES" you cannot update reflectance values. If you select "NO" you can update reflectance values.
- The next message is "ENTER #REPS (1-10)". The number of readings is displayed on the second line. To select the number of readings, press the "clear" key, and then enter the number of readings you want.
- If no DR check was selected, the next message is "PRINTING REFERENCE VALUES". A printout is made of the existing black and white correction factors and reflectances, for all 3 LEDs. Refer to the printout to see if you need to change any of the reflectances. You cannot change the correction factors at this time. You could use option 81 to manually change correction factors.

After the printout is completed, the message "CHECK REFERENCE VALUES / CHOOSE VALUE (SELECT TO END)" is displayed. Now you can change slide reflectances if necessary. First, press the following number to retrieve the reflectance value:

Press:

To Access:

1	White reflectance, green LED
2	White reflectance, yellow LED
3	White reflectance, red LED
4	Black reflectance, green LED
5	Black reflectance, yellow LED
6	Black reflectance, red LED

After you have selected a value, you can press "clear" to delete it. Then you can enter a new value. Be sure you enter the decimal point in the correct position.

Press the "chemistry select" key when all values are correct, and you are ready to continue.

- The next message is "INSERT STANDARDS SLIDE". This refers to the WHITE or BLACK REFERENCE SLIDE. Insert one of these tool slides.
- Because the REFERENCE SLIDES have no bar codes, the system cannot identify them. Now you must manually identify the reference slide you inserted. The next message will be "SLIDE NOT IDENTIFIED / SELECT TEST". Press the "chemistry select" key to display "WRDT", for the white reference slide, or "BRDT", for the black reference slide. Press "enter" when the correct identification is displayed.

Section 4. Options

Option	Type	Description
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- Now the system is ready to take the readings you selected. It will take approximately 2 minutes to process each set of the readings. (For example, if you selected 3 readings, you must wait approximately 6 minutes.) The message "WAIT UNTIL SLIDE PROCESSED" is displayed. You will hear the RACKS moving as the internal WHITE REFERENCE is moved for reference readings.
- The results of the first tests are printed, for each LED.

The "RD RATIO" result on the printout = $\frac{\text{slide reading}}{\text{internal WHITE REFERENCE reading}}$

The "A/D" result on the printout is the slide reading with no calculations.

The "REF" result is the A/D reading from the internal WHITE REFERENCE, on the LOWER RACK.

The "OFST" result is the A/D reading when all LEDS are off. This indicates the electrical "noise level" within the FORS ASSEMBLY.

If you previously selected "LONG FORM" and more than 1 reading, the mean and standard deviation are also printed.

- The "INSERT STANDARDS SLIDE" message is displayed again. Now insert the other tool slide, and wait for the results to be printed.
- The "INSERT STANDARDS SLIDE" message is displayed for a third time, but do **not insert a tool slide again**. Press the "cal mode" key.
- The message "CALCULATING CORRECTION" is displayed, and the new correction factors for the red LED are printed.
- The message "UPDATE CORRECTION FACTOR?" is displayed, with the "YES" response. If you want to enter the new correction factor on the printout into the system, press the "enter" key. If you do not want to enter the new correction factor, press the "chemistry select" key to display "NO", and then press "enter".
- The "CALCULATING CORRECTION" message is displayed again. Now the new correction factors for the green LED are printed. Select "YES" or "NO" to update.
- Then the new correction factors for the yellow LED are processed.

Section 4. Options

Option Type	Description
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30 DT60/DTSC
Customer

Checks or changes SAV values for colorimetric chemistries, and slope and intercept values for rate chemistries.

This option has 2 nonrelated functions. The first function relates to the SAVs. The other function relates to post-prediction values.

1. SAVs used for a calibration normally are retrieved from the CDM. Option 30 enables calibration with SAVs not stored in the CDM. The option is also used to retrieve the SAVs used in the last calibration of a chemistry.

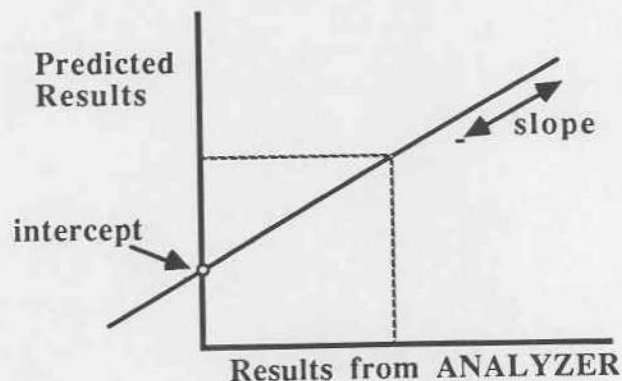
- The first message displayed is "SELECT CHEMISTRY".
- Press the "chemistry select" key to advance to the chemistry you want to test.
- Press the "1", "2", "3", or "4" keys to obtain the SAV values that were entered into the NONVOLATILE RAM during the last calibration.
- If you want to change the SAV value, press "clear", and enter the new value.
- Press "shift" and "service mode" to cancel the option.

Changing the SAVs does not change the calibration coefficients in the NONVOLATILE RAM. Calibration is necessary to change the calibration coefficients. Do not do this unless approval from Laboratory Specialist.

2. The other function of Option 30 relates to post-prediction values. Chemistry results can be changed and displayed for test conditions that are not the same as the existing conditions at which the tests are processed. These results are "post-prediction values." To do this operation, new slope and intercept values for the nonexistent conditions must be entered.

For example, in Europe test results are normally given for operating conditions of 30° C, not for the 37° C conditions normal for the DTSC Module. To change the test results for European prediction values, calculate:

$$\text{Predicted value} = (\text{Test results at } 37^{\circ} \text{ C} \times \text{slope}) + \text{intercept}$$



- Press the "6" key to display the post-prediction slope, and press the "7" key to obtain the post-prediction intercept. To change these values, press "clear" and enter the new value.

Section 4. Options

Option	Type	Description
		<ul style="list-style-type: none">• Press "service mode" to enter the new data, or to indicate that no data is changed.• Press "shift" and "service mode" to cancel this option. <p>The normal value for all these factors is 0. If the user enters a value different from 0, a post prediction calculation will be done for the selected chemistry. The results are displayed on the printout. No message will occur on the printout to indicate that the values were changed. If the results are not normal, check the slope and intercept values.</p>
31	DT60 Customer	<p>Uses values in the NONVOLATILE RAM for calibration, not the CDM values.</p> <p>Do not use this option with approval from a Laboratory Specialist. Cancel with option 0.</p>
32	DT60/DTSC Customer	<p>Allows checking or changing calibration coefficients.</p> <p>Use this option to check calibration or to do a quality control calibration.</p> <ul style="list-style-type: none">• Press "chemistry select" to select the chemistry.• Press "print" at any time to obtain a printout of the values for the selected chemistry.• Press "1", "2", "3", and "4" to obtain the parameters.• Press "5" to obtain the generation number.• To change a value, press "clear" and enter the new value.• Press "service mode" to enter the new data, or to indicate that no data is changed.• Press "shift" and "service mode" to cancel this option. <p>In addition to calibration coefficients, rate chemistries also require density limits for calibration. In V11.0, the density limits given for rate chemistries, along with the calibration coefficients. Press "6" to obtain the lower density limit. Press "7" to obtain the upper density limit. The descriptions of error codes L13 and L14 in the Diagnostics section explain these limits. Rate chemistries may not be manually calibrated with V10.7 because access is not available to the upper and lower density limits.</p>
33	DT60/DTSC Customer	<p>Checks or changes the spline values available in the CDM.</p> <p>Enter option 35 before entering option 33 to select the long or short format.</p> <ul style="list-style-type: none">• Press "chemistry select" to select SO, WG, and BF.• Enter the number for SO, WG, and BF that you want to check. If you want to change a value you entered, press "clear" and enter a new number.• Press "service mode" to enter the new data, or to indicate that no data is changed.• Press "print" to obtain spline data in the CDM.

Section 4. Options

Option Type	Description																																										
	<table><tr><th>Spline Value</th><th>Defined</th></tr><tr><td>SO</td><td>Chemistry Identification:</td></tr><tr><td></td><td><table><tr><td>0 = GLU</td><td>14 = TBIL*</td><td>42 = Na⁺</td><td>62 = ALT</td></tr><tr><td>1 = BUN</td><td>16 = HDLC</td><td>43 = CO₂</td><td>63 = LDH</td></tr><tr><td>5 = URIC</td><td>21 = HB</td><td>47 = AMYL</td><td>64 = CK</td></tr><tr><td>6 = TP</td><td>24 = THEO</td><td>48 = AST</td><td>65 = ALKP</td></tr><tr><td>7 = TRIG</td><td>40 = Cl⁻</td><td>49 = CK-MB</td><td>67 = GGT</td></tr><tr><td>8 = CHOL</td><td>41 = K⁺</td><td>59 = LYP</td><td></td></tr></table></td></tr><tr><td></td><td>* The SO number indicated on the TBIL box is 28.</td></tr><tr><td>WG</td><td>Web generation number</td></tr><tr><td>KN</td><td>Kit number</td></tr><tr><td>BF</td><td>Body fluid</td></tr></table> <p>"BF" is identified by a letter. For example, "S" is serum. The value must be entered on the KEYBOARD. The keys "0" to "9" are the characters A to J. Press "shift" and the keys "0" to "9" to enter the characters K to T. At this time, leave BF blank because only plasma or serum is processed.</p> <tr><td>34 DT60 Customer</td><td><p>Checks the SAV values available in the CDM.</p><p>IMPORTANT</p><p>Enter option 35 before entering option 34.</p><ul style="list-style-type: none">Press "chemistry select" to select SO, WG, BF, and KN.Enter the number for SO, WG, and KN that you want to check. NOTE: Each number selected provides a shorter retrieval. If no number is entered, all the values in the CDM memory will be printed.Press "print" to obtain the spline data in the CDM.<p>Lot no. on box: ## ## — #### — ####</p><p> [SO] [WG] [Batch or [Lot No.]</p><p> coating]</p></td></tr> <tr><td>35 DT60 Customer</td><td><p>Selects the long or short format for options 33 and 34.</p><p>Enter option 35 before entering options 33 or 34.</p><ul style="list-style-type: none">Enter "1" to select the long format and "2" to select the short format.<p>For option 33, the short format includes CDM header information, and the record number, SO number, and generation number for each selected spline record. In long format, the K factor, low and high limit, and all spline knots are also printed.</p><p>For option 34, the short format includes CDM header information, and the record number, SO number, generation number, body fluid code, and kit number for each selected record. In long format, the SAV values are also printed. A displayed record number indicates that the CDM supports your selections.</p></td></tr>	Spline Value	Defined	SO	Chemistry Identification:		<table><tr><td>0 = GLU</td><td>14 = TBIL*</td><td>42 = Na⁺</td><td>62 = ALT</td></tr><tr><td>1 = BUN</td><td>16 = HDLC</td><td>43 = CO₂</td><td>63 = LDH</td></tr><tr><td>5 = URIC</td><td>21 = HB</td><td>47 = AMYL</td><td>64 = CK</td></tr><tr><td>6 = TP</td><td>24 = THEO</td><td>48 = AST</td><td>65 = ALKP</td></tr><tr><td>7 = TRIG</td><td>40 = Cl⁻</td><td>49 = CK-MB</td><td>67 = GGT</td></tr><tr><td>8 = CHOL</td><td>41 = K⁺</td><td>59 = LYP</td><td></td></tr></table>	0 = GLU	14 = TBIL*	42 = Na ⁺	62 = ALT	1 = BUN	16 = HDLC	43 = CO ₂	63 = LDH	5 = URIC	21 = HB	47 = AMYL	64 = CK	6 = TP	24 = THEO	48 = AST	65 = ALKP	7 = TRIG	40 = Cl ⁻	49 = CK-MB	67 = GGT	8 = CHOL	41 = K ⁺	59 = LYP			* The SO number indicated on the TBIL box is 28.	WG	Web generation number	KN	Kit number	BF	Body fluid	34 DT60 Customer	<p>Checks the SAV values available in the CDM.</p> <p>IMPORTANT</p> <p>Enter option 35 before entering option 34.</p> <ul style="list-style-type: none">Press "chemistry select" to select SO, WG, BF, and KN.Enter the number for SO, WG, and KN that you want to check. NOTE: Each number selected provides a shorter retrieval. If no number is entered, all the values in the CDM memory will be printed.Press "print" to obtain the spline data in the CDM. <p>Lot no. on box: ## ## — #### — ####</p> <p> [SO] [WG] [Batch or [Lot No.]</p> <p> coating]</p>	35 DT60 Customer	<p>Selects the long or short format for options 33 and 34.</p> <p>Enter option 35 before entering options 33 or 34.</p> <ul style="list-style-type: none">Enter "1" to select the long format and "2" to select the short format. <p>For option 33, the short format includes CDM header information, and the record number, SO number, and generation number for each selected spline record. In long format, the K factor, low and high limit, and all spline knots are also printed.</p> <p>For option 34, the short format includes CDM header information, and the record number, SO number, generation number, body fluid code, and kit number for each selected record. In long format, the SAV values are also printed. A displayed record number indicates that the CDM supports your selections.</p>
Spline Value	Defined																																										
SO	Chemistry Identification:																																										
	<table><tr><td>0 = GLU</td><td>14 = TBIL*</td><td>42 = Na⁺</td><td>62 = ALT</td></tr><tr><td>1 = BUN</td><td>16 = HDLC</td><td>43 = CO₂</td><td>63 = LDH</td></tr><tr><td>5 = URIC</td><td>21 = HB</td><td>47 = AMYL</td><td>64 = CK</td></tr><tr><td>6 = TP</td><td>24 = THEO</td><td>48 = AST</td><td>65 = ALKP</td></tr><tr><td>7 = TRIG</td><td>40 = Cl⁻</td><td>49 = CK-MB</td><td>67 = GGT</td></tr><tr><td>8 = CHOL</td><td>41 = K⁺</td><td>59 = LYP</td><td></td></tr></table>	0 = GLU	14 = TBIL*	42 = Na ⁺	62 = ALT	1 = BUN	16 = HDLC	43 = CO ₂	63 = LDH	5 = URIC	21 = HB	47 = AMYL	64 = CK	6 = TP	24 = THEO	48 = AST	65 = ALKP	7 = TRIG	40 = Cl ⁻	49 = CK-MB	67 = GGT	8 = CHOL	41 = K ⁺	59 = LYP																			
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	* The SO number indicated on the TBIL box is 28.																																										
WG	Web generation number																																										
KN	Kit number																																										
BF	Body fluid																																										
34 DT60 Customer	<p>Checks the SAV values available in the CDM.</p> <p>IMPORTANT</p> <p>Enter option 35 before entering option 34.</p> <ul style="list-style-type: none">Press "chemistry select" to select SO, WG, BF, and KN.Enter the number for SO, WG, and KN that you want to check. NOTE: Each number selected provides a shorter retrieval. If no number is entered, all the values in the CDM memory will be printed.Press "print" to obtain the spline data in the CDM. <p>Lot no. on box: ## ## — #### — ####</p> <p> [SO] [WG] [Batch or [Lot No.]</p> <p> coating]</p>																																										
35 DT60 Customer	<p>Selects the long or short format for options 33 and 34.</p> <p>Enter option 35 before entering options 33 or 34.</p> <ul style="list-style-type: none">Enter "1" to select the long format and "2" to select the short format. <p>For option 33, the short format includes CDM header information, and the record number, SO number, and generation number for each selected spline record. In long format, the K factor, low and high limit, and all spline knots are also printed.</p> <p>For option 34, the short format includes CDM header information, and the record number, SO number, generation number, body fluid code, and kit number for each selected record. In long format, the SAV values are also printed. A displayed record number indicates that the CDM supports your selections.</p>																																										

Section 4. Options

Option	Type	Description								
36	DT60 Customer	<p>Makes a printout of the correction factors and reflectance values for colorimetric chemistries.</p> <p>Use option 81 to enter correction factors. Use option 50 to obtain the correction factors and reflectance values for rate chemistries.</p>								
40	DTE Customer	Moves the ELECTROMETER from the home•position to the read station.								
41	DTE Customer	Moves the ELECTROMETER from the read station to the home•position.								
42	DTE Customer	<p>Operates the ELECTROMETER for 1 to 99 cycles.</p> <p>The ELECTROMETER moves from the home•position to the read station for the selected number of cycles.</p>								
43	DTE Customer	<p>Checks the electrical operation of the ELECTROMETER.</p> <p>If the operation is correct, the printout displays the "GAIN FACTOR", "REF. VALUE", and "OFFSET VALUE". The following specifications are correct for each value:</p> <table><tr><th>Value</th><th>Specification</th></tr><tr><td>"GAIN FACTOR</td><td>-21.5 to -24.0</td></tr><tr><td>"REF. VALUE"</td><td>Results invalid</td></tr><tr><td>"OFFSET VALUE"</td><td>Results invalid</td></tr></table> <p>Use these specifications only as directed by a diagnostics procedure.</p>	Value	Specification	"GAIN FACTOR	-21.5 to -24.0	"REF. VALUE"	Results invalid	"OFFSET VALUE"	Results invalid
Value	Specification									
"GAIN FACTOR	-21.5 to -24.0									
"REF. VALUE"	Results invalid									
"OFFSET VALUE"	Results invalid									
44	DTE Customer	<p>Checks the FAN and the heating system on the <i>DTE</i> Module</p> <p>Checks the operation of the heating system with a 10 second heating cycle and then a 20 second cooling cycle while the FAN is operating. The printout indicates "PASS" or "FAIL".</p>								
50	DTSC Customer	<p>Makes a printout of the gains for sample and reference readings, the correction factors, and the reflectance values for rate chemistries.</p> <p>The results are printed with the corresponding filter wavelength, for all filter positions that the CLM defines in use.</p> <p>Use option 101 to enter correction factors. Use option 36 to obtain a printout of</p>								

Section 4. Options

Option	Type	Description
		the colorimetric correction factors and reflectance values.
51	DTSC Customer	<p>Makes a printout of the flash count for the FLASH LAMP.</p> <p>The NONVOLATILE RAM in the <i>DTSC</i> Module monitors the number of times the FLASH LAMP is energized. Option 51 retrieves this data by a bus message. The number is divided by 1000 and displayed in units of 1000. Example: "CURRENT FLASH COUNT 123K".</p> <p style="text-align: center;">IMPORTANT</p> <p style="text-align: center;">Do not use option 51 with version 11.0 software.</p> <p>Use option 104 to reset the value of the flash count to 0.</p>
52	DTSC Customer	<p>Makes a printout of the temperature of the <i>DTSC</i> Module.</p> <p>Option 52 sends a bus message to the <i>DTSC</i> Module to obtain the temperature of the LOWER HEATING ELEMENT at the Read Station. The temperature is calculated to °C using the following formula:</p> $\text{Temperature}^{\circ}\text{C} = \frac{\text{A/D Reading} - \text{A/D Setpoint}}{\text{Conversion Factor}} + 37.0$ <p>In V11.0 software only, 4 separate temperature are given, for each of the following components:</p> <ul style="list-style-type: none">• PREHEAT PLATEN ASSEMBLY – Read Station• READ ARM THERMISTOR• PREHEAT PLATEN ASSEMBLY – Preheat Station• PREHEAT ARM THERMISTOR
53	DTSC Customer	<p>Displays the software version used in the <i>DTSC</i> Module.</p> <p>Use option 13 to display the software version used in the <i>DT60</i> Analyzer.</p>
60	DT60 Service	<p>Selects colorimetric test time.</p> <p>The test time limits are 39 to 999 seconds. Normal test time is 313 seconds. Deenergizing and energizing the Analyzer resets the time to 313 seconds.</p> <p>Use option 62 to select potentiometric test time.</p>
61	DT60 Service	<p>Provides a selected number of A/D readings.</p> <p>Allows the FE to select 1 to 99 readings during the next test. The <i>DT60</i> Analyzer makes a reading and printout each 3 seconds. If option 14 is selected with this option, then the number of readings may be less than the number of readings selected by the FE. This option also checks temporary variations in the FORS ASSEMBLY. Use option 61 in the operating mode or in the calibration mode.</p>

Section 4. Options

Option	Type	Description
62	DTE Service	<p>Selects potentiometric test time.</p> <p>The test time limits are 60 to 999 seconds. Normal potentiometric test time is 180 seconds. Deenergizing and energizing the Analyzer resets the time to 180 seconds.</p> <p>Use option 60 to select the colorimetric test time.</p>
63	DT60 Service	<p>Selects U.S. measurements.</p> <p>See option 92 for information on using option 63 for BUN/UREA results.</p>
64	DT60 Service	<p>Selects S.I. measurements.</p> <p>"S.I." is "Standard International" or metric measurement. See option 92 for information on using option 63 for BUN/UREA results.</p>
66	DT60 Service	<p>Enables the data logger.</p> <p>This option is not normally used by field personnel.</p>
68	DT60 Service	<p>Moves the TRANSPORT MECHANISM a selected number of steps.</p> <p>Select a motion of -255 to +255 steps from the original position.</p>
70	DT60/DTSC Service	<p>Disables the temperature monitoring and COVER SWITCH functions.</p> <p>Use this option when you want to do diagnostic procedures with the COVER open or the temperature out of range. This option disables these functions on both the <i>DT60</i> Analyzer and the <i>DTSC</i> Module. To cancel this option, you must deenergize the <i>DT60</i> Analyzer. If this option is in use when tests are being processed, the results may not be correct. There is no indication that option 70 is in use.</p>
73	DT60 Service	<p>Clears data from the NONVOLATILE RAM in the <i>DT60</i> Analyzer.</p> <p>Clears the following data for the <i>DT60</i> Analyzer, <i>DTE</i> Module, and <i>DTSC</i> Module:</p> <ul style="list-style-type: none">• reflectance values• correction factors• reporting modes (options 63, 64, 92, 93)• calibration

Section 4. Options

Option	Type	Description
		Do the following special procedures after option 73 is used, or manually input data from dated, stored printouts:
		<ul style="list-style-type: none">• Correction Factors for White Reference and Black Reference in the <i>DT60</i> Analyzer• Calibration of the <i>DT60</i> Analyzer and the <i>DTE</i> Module• Calibration of the <i>DTSC</i> Module
74	DT60 Service	<p>Moves the BLACK REFERENCE to the read station.</p> <p>Moves the BLACK REFERENCE PATCH on the LOWER RACK to a position above the FORS HEAD. Use this option after executing option 2.</p>
75	DT60 Service	<p>Disables the slide transport error codes.</p> <p>The circuit for the SLIDE SENSOR is disabled. Use this option for both operating mode and calibration mode. Error codes F12, F13, and F14 will not occur. Cancel with option 0.</p>
76	DT60 Service	<p>Provides a reading for the black reference by energizing an LED in the operating mode.</p> <p>In normal operation, black reference readings are made by deenergizing all LEDS in the FORS ASSEMBLY. But when option 76 is executed, the black reference readings are made by energizing an LED when an internal BLACK REFERENCE surface is above the FORS HEAD. Cancel with option 0.</p>
81	DT60 Service	<p>Checks or changes the correction factors for colorimetric chemistries.</p> <p>The correction factors are stored in the NONVOLATILE RAM of the <i>DT60</i> Analyzer. Option 81 retrieves and displays the correction factors.</p> <ul style="list-style-type: none">• Press "enter" to keep the contents displayed and to advance to the next value.• Press "clear" to delete the value displayed, and then enter the new correction factor. <p>Check correction factors and reflectance values when you do any of these procedures:</p> <ul style="list-style-type: none">• install a new FORS HEAD ASSEMBLY• install a new LOWER RACK• install a new MECHANICAL MODULE• install a new HEATER ROD and THERMISTOR• adjust the LOWER RACK or HOME SENSOR• install a new MOTOR AND PINION ASSEMBLY• install a new HOME SENSOR <p>Use option 83 to calculate new correction factors. Use option 101 to check or change the correction factors for colorimetric chemistries.</p>

Section 4. Options

Option	Type	Description
82	DT60 Service	<p>Checks or changes the reflectance values for colorimetric chemistries.</p> <p>These values are stored in the NONVOLATILE RAM of the DT60 Analyzer.</p> <ul style="list-style-type: none">• Press "enter" to keep the contents displayed and to advance to the next value.• Press "clear" to delete the value displayed, and then enter the new correction factor.
83	DT60 Service	<p>Calculates and revises new correction factors for colorimetric chemistries.</p> <p style="text-align: center;">IMPORTANT</p> <p>Do not use option 83 with V11.0 software. Use option 29 instead.</p> <p>The first message displayed is "REFERENCE SLIDE MODE".</p> <ul style="list-style-type: none">• Press "enter" to select the LED color.• Press "chemistry select" to select the WHITE or BLACK REFERENCE SLIDE.• Insert the WHITE or BLACK REFERENCE SLIDE.• Wait for the test to be completed.• Press "cal mode" to calculate the new correction factors and to enter them into the NONVOLATILE RAM in the DT60 Analyzer. <p>Do new correction factors when you do any of these procedures:</p> <ul style="list-style-type: none">• install a new FORS HEAD ASSEMBLY• install a new LOWER RACK• install a new MECHANICAL MODULE• install a new HEATER ROD and THERMISTOR• adjust the LOWER RACK or HOME SENSOR• install a new MOTOR AND PINION ASSEMBLY• install a new HOME SENSOR <p>Use option 81 to check or change the correction factors. Use option 36 to obtain the existing correction factors and reflectance values. Use option 103 to calculate and revise new correction factors for the rate chemistries.</p>
88	DT60 Service	<p>Calculates and makes a printout of the checksums of each PROM.</p>
90	DT60 Service	<p>Enables the DATA LOGGER for the DTE Module.</p> <p>This option is not normally used by service personnel.</p>
92	DT60 Service	<p>Reports BUN/UREA as UREA in mg/dl.</p> <p>See option 93 also.</p>

Section 4. Options

Option	Type	Description								
93	DT60 Service	<p>Reports urea nitrate as "BUN", or as "UREA" in mmols/L.</p> <p>Urea nitrate results are reported as "BUN" in mg/dl. Or, if S.I. units were selected before with option 64, option 93 reports urea nitrate as "UREA" in mmols/L. Ask if the customer wants results of the test for "blood urea nitrogen" as "UREA" or "BUN". Also ask if the customer wants results in "mg/dl" or "mmols/L". Use the following options to get the correct results:</p> <table><tr><th>Options</th><th>Results</th></tr><tr><td>63 and 92</td><td>UREA, mg/dl</td></tr><tr><td>63 and 93</td><td>BUN, mg/dl</td></tr><tr><td>64 and 93</td><td>UREA, mmols/L</td></tr></table>	Options	Results	63 and 92	UREA, mg/dl	63 and 93	BUN, mg/dl	64 and 93	UREA, mmols/L
Options	Results									
63 and 92	UREA, mg/dl									
63 and 93	BUN, mg/dl									
64 and 93	UREA, mmols/L									
94	DT60 Service	<p>Reports colorimetric DR values for reference slides.</p> <p>IMPORTANT</p> <p>Do not use option 94 with V11.0 software. Use option 29 instead.</p> <p>Use options 14 and 83 to calculate the DR values.</p>								
101	DTSC Service	<p>Checks or changes the correction factors for rate chemistries.</p> <p>The correction factors are stored in the NONVOLATILE RAM in the <i>DT60</i> Analyzer. Option 101 displays the correction factors in sequence, for each filter position that the CLM defines in use.</p> <ul style="list-style-type: none">• Press "enter" to advance to another filter position.• To enter a new correction factor, press "clear", and enter the new value.• The option stops when all filter positions have been checked. <p>Use option 103 to calculate new correction factors. Use option 81 to check or change the correction factors for colorimetric chemistries.</p>								
102	DTSC Service	<p>Checks or changes the reflectance values for rate chemistries.</p> <p>The reflectance values for the WHITE and BLACK REFERENCE SLIDES TL-3575 and TL-3576 are stored in the NONVOLATILE RAM in the <i>DT60</i> Analyzer. Option 102 displays the reflectance values in sequence, for each filter position that the CLM defines in use.</p> <ul style="list-style-type: none">• Press "enter" to advance to another filter position.• To enter a new reflectance value, press "clear", and enter the new value.• The option stops when all filter positions have been checked. <p>Use option 82 to check or change the reflectance values for colorimetric chemistries.</p>								

Section 4. Options

Option Type

Description

103 DTSC Service

Calculates correction factors for rate chemistries.

Option 103 calculates correction factors by comparing the internal white and black reference readings with the given reflectance readings taken from the WHITE and BLACK REFERENCE SLIDES, TL-3575 and TL-3576. The reflectance values for the REFERENCE SLIDES must be correctly entered with option 102 before option 103 can be executed.

- Black reference readings are taken for all filter positions, with the READ ARM up. Reading limits are 0 to 1000 A/D units.
- White reference readings are taken for all filter positions, with the READ ARM down. Reading limits are 26140 to 32676 A/D units.
- Insert the WHITE REFERENCE SLIDE TL-3575 when the message is displayed. The SLIDE moves to the Read Station, and is read for all filter positions. Reading limits are 20000 to 32676 A/D units.
- Insert the BLACK REFERENCE SLIDE TL-3576 when the message is displayed. The SLIDE moves to the Read Station, and is read for all filter positions. Reading limits are 0 to 1000 A/D units.
- Approximately 4 readings are taken for both slides at all filter positions. The correction factors are calculated and entered into the NONVOLATILE RAM in the DTSC Module.
- The printout displays: correction factors, reflectances, reference gains, and sample gains. Results are given for each of the filter wavelengths. The "FILTER NO." on the printout corresponds to the following wavelengths:

<u>Filter No.</u>	<u>Wavelength</u>
0	340 nm
1	Not used
2	400 nm
3	Not used
4	Not used
5	460 nm
6	Not used
7	680 nm
8	Not used
9	Blank

NOTE

The printout will indicate if an error is detected for any filter position. No correction factor will be loaded for a filter position that has an error.

Calculate new correction factors after doing any of the following procedures:

- installing a new FLASH LAMP
- installing a new READ ARM AND HEATER ASSEMBLY
- installing a new REFLECTOMETER ASSEMBLY
- installing a new ANALOG BOARD
- installing a new FILTER WHEEL ENCLOSURE ASSEMBLY
- removing and installing the REFLECTOMETER ASSEMBLY
- installing a new FLASH POWER SUPPLY

Section 4. Options

Option	Type	Description																						
		Calculate new correction factors when: <ul style="list-style-type: none">• the <i>DTSC</i> Module is installed• if the DR procedure is not successful• at least once each year. Use option 101 to check or change correction factors. Use option 50 to obtain the existing correction factors and reflectance values. Use option 83 to calculate correction factors for colorimetric chemistries.																						
104	DTSC Service	<p>Resets the flash count.</p> <p>The NONVOLATILE RAM in the <i>DTSC</i> Module monitors the number of times the FLASH LAMP is energized. Option 104 sends a bus message to the <i>DTSC</i> Module that resets the count to 0.</p> <p style="text-align: center;">CAUTION</p> <p>Execute this option only when installing a new FLASH LAMP, or important data about the life of the FLASH LAMP will be deleted.</p> <p>Use option 51 to obtain the existing flash count.</p>																						
105	DTSC Service	<p>Selects the filter position in the <i>DTSC</i> Module for a corresponding wavelength.</p> <p>Filter wavelengths are stored in a table in the CLM. Option 105 continues to ask for a wavelength until a correct value is entered. When a correct wavelength is entered, a bus message is sent to the <i>DTSC</i> Module to move the FILTER WHEEL to the corresponding filter. The correct filter wavelengths are:</p> <table><tr><th>Filter No.</th><th>Wavelength</th></tr><tr><td>0</td><td>340 nm</td></tr><tr><td>1</td><td>Not used</td></tr><tr><td>2</td><td>400 nm</td></tr><tr><td>3</td><td>Not used</td></tr><tr><td>4</td><td>Not used</td></tr><tr><td>5</td><td>460 nm</td></tr><tr><td>6</td><td>Not used</td></tr><tr><td>7</td><td>680 nm</td></tr><tr><td>8</td><td>Not used</td></tr><tr><td>9</td><td>Blank</td></tr></table>	Filter No.	Wavelength	0	340 nm	1	Not used	2	400 nm	3	Not used	4	Not used	5	460 nm	6	Not used	7	680 nm	8	Not used	9	Blank
Filter No.	Wavelength																							
0	340 nm																							
1	Not used																							
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3	Not used																							
4	Not used																							
5	460 nm																							
6	Not used																							
7	680 nm																							
8	Not used																							
9	Blank																							
106	DTSC Service	<p>Makes a selected number of readings on a rate slide.</p> <p>Option 106 has 3 modes or "types":</p> <ul style="list-style-type: none">• Type 1, the "ratio" mode. Sample and reference readings are processed similar to the normal run mode. The sample reading is compared to the																						

Section 4. Options

Option Type

Description

reference reading. The A/D and DR values for the sample reading are adjusted. Use type 1 to calculate DR values for WHITE and BLACK REFERENCE SLIDES.

- Type 2, the "reference" mode, compares the reading from the REFERENCE CHANNEL to a constant 10 V ac, by calculating:

$$\frac{\text{REFERENCE CHANNEL Readings with Gain x 32767}}{10 \text{ V dc}}$$

The A/D limits are 26140 to 32767 units. The result is the voltage produced by the REFERENCE PHOTODIODE.

- Type 3, the "sample" mode, compares the reading from the SAMPLE CHANNEL to a constant 10 V ac, by calculating:

$$\frac{\text{SAMPLE CHANNEL Readings with Gain x 32767}}{10 \text{ V dc}}$$

The A/D limits are -200 to 32767 units. The result is the voltage produced by the SAMPLE PHOTODIODE.

Do the following steps to execute option 106:

- Enter "1", "2", or "3" to select the type.
- Enter a filter wavelength for the readings. The option will continue to ask for a wavelength until a correct value is entered.
- Enter the number of readings, from 1 to 99.
- Insert the slide. In some procedures you must remove the slide before it is engaged by the SLIDE CLIP. This will enable readings of the internal WHITE REFERENCE surface. Inserting the slide is necessary to start the option sequence.

The option will execute these functions:

- The READ ARM is lifted.
- A black reference reading is made.
- The READ ARM moves down.
- A white reference reading is made.
- The slide (if any) moves to the read station.
- The selected number of readings are taken.
- The A/D and DR results are displayed on the printout.
- The slide is discarded in the DISPOSAL CUP.

107 DTSC Service

Operates the rate slide transport system continually.

Option 107 operates the slide transport system in the DTSC Module in a continual, automatic function, simulating normal operation. When option 107 is executed, the only operating keys are "shift" and "clear". You must

Section 4. Options

Option	Type	Description
		load a slide when using option 107, or the transport system will not operate.
		<ul style="list-style-type: none">• The first message displayed is "DTSC SLIDE TRANSPORT".• Press "shift" to start the motion. Press "clear" to cancel the option. These commands send bus messages to the <i>DTSC</i> Module.• Minimum processing times are allowed at each station. No spotting is necessary for this option.• Press "shift" to stop the motion at the next station. Press "shift" again to continue the motion.
		This option can simulate transport of more than one slide by using the following procedure:
		<ul style="list-style-type: none">• When the first slide is in the Read Station, insert another slide at the Pickup Station.• The SLIDE TRANSPORT CLIP moves to engage the slide at the Pickup Station.• The SLIDE TRANSPORT CLIP advances the new slide to the Preheat Station.• The SLIDE TRANSPORT CLIP advances to the first slide in the Read Station when the processing time is completed.• The slide is engaged and moved to the Discard Station.• The SLIDE TRANSPORT CLIP moves to the home position.• When the time in the Preheat Station is completed, the SLIDE TRANSPORT CLIP moves to the Preheat Station, engages the slide, and continues to advance it to the next stations.
108	DTSC Service	Advances rate slides from station to station. <p>This option advances a slide in the <i>DTSC</i> Module from station to station in sequence. When option 108 is executed, the only operating keys are "shift" and "clear". If a slide is not loaded, the transport mechanism will operate from station to station.</p> <ul style="list-style-type: none">• The first message displayed is "DTSC STEPPING SLIDE TRANSPORT".• Press "shift". A bus message is sent to the <i>DTSC</i> Module to move the SLIDE CLIP to the Pickup Station.• Press "shift" again to advance to the next stations.• Press "clear" to cancel the option.
109	DTSC Service	Checks the operation of the HALL EFFECT SENSORS. <ul style="list-style-type: none">• Press "shift" to make a printout of the readings for the HALL EFFECT SENSORS.• Press "clear" to cancel the option.

Section 4. Options

Option	Type	Description
110	DTSC Service	<p>Operates the SLIDER CAM continually.</p> <ul style="list-style-type: none">• Press "shift" to start the motion.• Press "clear" to cancel the option. <p>Use this option to check the operation of the SLIDER CAM. You can also use option 110 to find the home position for the SLIDER CAM after it is installed or moved. See option 111 also.</p>
111	DTSC Service	<p>Moves the SLIDER CAM from station to station.</p> <p>The 3 stations for the SLIDER CAM are:</p> <ul style="list-style-type: none">• Home position, with the SLIDER CAM between the READ ARM and the PREHEAT ARM.• Right, with the SLIDER CAM lifting the PREHEAT ARM.• Left, with the SLIDER CAM lifting the READ ARM. <p>To execute option 111:</p> <ul style="list-style-type: none">• Press "shift" to start the motion.• Press "clear" to cancel the option. <p>Use this option to check the operation of the SLIDER CAM. You can also use option 111 to find the home position for the SLIDER CAM after it is installed or moved. See option 110 also.</p>
112	DTSC Service	<p>Clears data from the NONVOLATILE RAM in the DTSC Module.</p> <p>The NONVOLATILE RAM in the DTSC Module stores data for FILTER MOTOR phases, correction factors, and other information. In normal operation, the phases for the FILTER MOTOR are loaded into the NONVOLATILE RAM only if the corresponding memory locations are blank. Option 112 clears existing data from the memory, to allow the loading of new values.</p> <p>Use option 73 to clear data from the NONVOLATILE RAM in the Analyzer.</p>

Section 4. Options

Option	Type	Description
120	DTSC Service	<p>Operate FLASH LAMP continually.</p> <p>This option allows you to select a given number of seconds between flashes, and then operates the FLASH LAMP continually. Cancel the option by deenergizing the <i>DTSC</i> Module.</p>

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Customer Equipment Services

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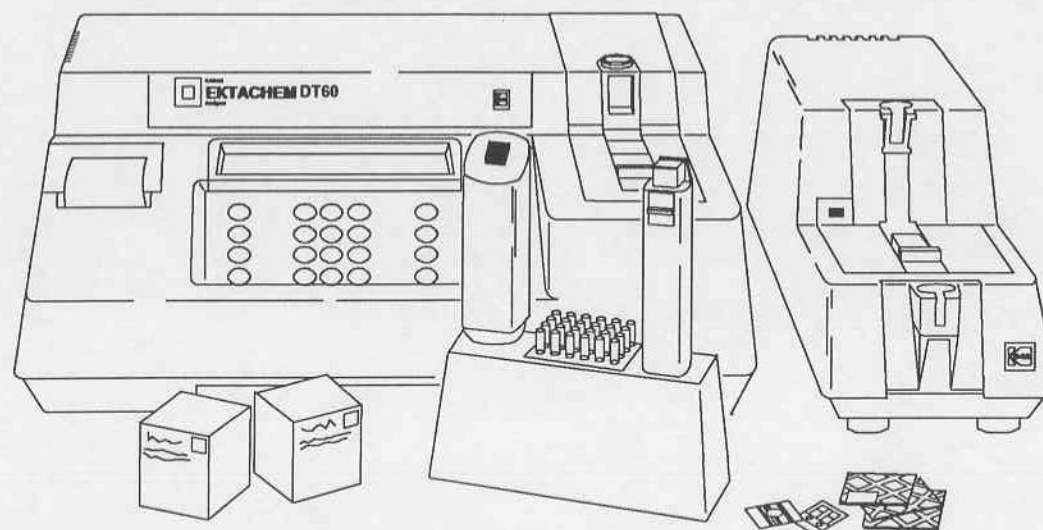
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Supersedes XP3100-17

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DIAGNOSTICS
KODAK EKTACHEM DT60 ANALYZER
KODAK EKTACHEM DTE MODULE

Section 5



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PLEASE NOTE

The information contained herein is based on the experience and knowledge relating to the subject matter gained by Eastman Kodak Company prior to publication.

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CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Diagnosing and Repairing Malfunctions

Error Codes

The diagnostic software in the *Kodak Ektachem DT60 ANALYZER* monitors the operation of many components and systems for itself and for the *Kodak Ektachem DTE MODULE*. When an error condition is detected, the diagnostic software might display an error code or an error message to indicate the malfunction. The error code could be displayed on the LC DISPLAY, on the printout, or on both. A short description of the malfunction, or an error message, is included with each error code.

Error codes might prevent the operator from continuing normal operation of the equipment. By stopping normal operation, the quality of the test results is protected. The error codes might:

- require the operator to do an operation again.
- allow the operator to enter options but not allow calibration or slide processing.
- initialize the equipment and start normal operation again.
- display an error message instead of test results.
- prevent any operation before the malfunction is repaired.

The Operator's Manual has instructions for the operator that explain what to do if an error code occurs. Normally, if this action does not repair the malfunction, or if the error code occurs frequently or intermittently, the operator will order service. For some error codes, the Operator's Manual only instructs the operator to place a call for service immediately.

It is important to understand that error codes might not be caused by the condition indicated in the error message. Because the software functions are complex and closely related, the diagnostic software could report a software malfunction as an equipment malfunction. Error codes for the *DT60 ANALYZER* and the *DTE MODULE* have a letter and a number.

- The "C" error codes, C12 to C21, indicate **calibration** malfunctions.
- The "D" error codes, D11 to D20, indicate **data** storage malfunctions.
- The "E" error codes, E11 to E20, indicate a malfunction in the **ELECTROMETER**.
- The "F" error codes, F12 to F20, indicate a malfunction in the mechanical **function** of a STEPPER MOTOR.
- The "H" error codes, H11 to H15, indicate a malfunction in the **heating** system.
- The "R" error codes, R11 to R18, indicate a **reflectance** malfunction in the FORS ASSEMBLY.

Error Messages

Not all error conditions have corresponding error codes. Some error messages occur without error codes, for example, the message "RESULTS ABOVE ANALYZER RANGE". The diagnostic procedures include instructions for these error messages, similar to the instructions for error codes.

Error Conditions without Error Codes or Error Messages

Some error conditions do not have either error codes or error messages. For example, an operator might load a slide into the SPOTTING STATION, but no response occurs from the equipment, and no error code is

executed. The diagnostic procedures include instructions for these error conditions, similar to the instructions for error codes.

When tests or quality control procedures provide results without precision or accuracy, the FE must determine if the equipment has a malfunction, or if the error is caused by the materials or the operator. The section, "Problems with Precision and Accuracy", includes a table of Chemistry Sensitivities and information to help diagnose equipment malfunctions that are related to those sensitivities.

Content of the Diagnostic Procedures

The following procedures will provide all the information necessary to diagnose and repair malfunctions in the *DT60 ANALYZER* and the *DTE MODULE*. The Diagnostics section has 2 main parts:

- Error Code Tables about error codes
- Tables for error conditions that do not have error codes

The Error Code Tables have the following information:

- The **Error Code**, the **Error Message**, or the **Error Condition**.
- A **Description** of the error, including information about normal operation of the related component or system, and the condition that executes the error code.
- A **Possible Replacement Parts** list that includes most of the replacement parts that could be necessary for repairing the malfunction.
- A **Special Tools and Special Materials** list with special tools and materials that are necessary to diagnose and repair the malfunction.
- A list of **Additional Information** that includes other resources in the service publication with information about the malfunction.
- A **Specifications** section that provides information from adjustments, special procedures, and checkout procedures.
- A table of "**Possible Causes**" and "**Recommended Actions**". The possible causes are included together in the same list if they are similar. For example, one list might have operator errors, other lists might have problems related to a component in the system, and another list might have malfunctions of the data communications. Each list of possible causes has a corresponding list of recommended actions, which are steps or procedures for diagnosing and repairing the malfunction. Each table also includes a section, "**To check for correct operation:**". This section provides information to use before completing the service call.

Using Diagnostic Procedures to Repair Malfunctions

When possible, speak to the customer on the telephone before going to the site. Obtain the following information:

- What was the operator doing when the error occurred?
- Are any error codes indicated?
- What actions did the operator take to repair the malfunction?
- Are any chemistries having problems with precision or accuracy?

Some frequent operator errors are:

- A slide was not inserted correctly.
- A slide was not identified correctly. (The operator entered a slide type that was not correct, causing the results to be "out of range")
- The slides were not at room temperature when they were processed.
- The PIPETTE was not used correctly.
- The fluids were not prepared correctly.

Locate the error code, the error message, or the error condition in the diagnostics section. Note the parts and special tools and materials that might be necessary for the service call.

At the customer site, check normal operation to determine if the malfunction or error code occurs again. When you check normal operation, you will obtain more information about the malfunction.

Check for visible causes of a malfunction. The causes might include disconnected CONNECTORS, adjustments that are not correct, BOARDS that are not seated correctly, and SWITCHES that are not in the correct position. All this information is included in the Error Tables.

Use the diagnostics to detect the cause of the malfunction. Determine the necessary steps to repair the malfunction.

Check for correct operation before leaving the customer site.

Provide any necessary information to SCAN, using the correct error code. Note that some codes should not be used as primary codes for SCAN. That information is provided in the description for the code.

Use the correct procedure for handling removed parts.

Malfunctions Related to Chemistry

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If you do not have training to answer questions about chemistries or test results, ask the customer to obtain information from the **CPD Customer Support Center** in Rochester. FEs can also obtain information from the Customer Support Center.

The telephone number is: 800/521-0098

Malfunctions Related to the Customer Computer

If the customer is using a computer with the *DT60* ANALYZER, data communication problems between the *DT60* ANALYZER and the customer computer could occur. The diagnostic procedures are included in Options, section 4 of this service publication. The publication, "Specifications for Computer Interface" for the *DT60* ANALYZER, is included in General Information, section 1 of this service publication.

IMPORTANT

Kodak personnel should not diagnose or repair malfunctions in the data signals from the customer computer. Do the checkout and repair procedures for the *DT60* ANALYZER, and if the malfunction continues to occur, the customer should obtain service for the computer.

Status Code C12 — "INVALID CALIBRATION"

Description

When any "C" error code occurs, Status Code C12 and the message, "INVALID CALIBRATION", are indicated first on the printout. An additional "C" code is indicated on the printout or in the LC DISPLAY. Status Code C12 cannot be diagnosed separately. To diagnose the malfunction, see the description and the diagnostic table for the additional "C" code.

IMPORTANT

Do not use "C12" as a Purpose Code for SCAN.

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Error Code C13 — "EXTREMA ERROR"

Description

In the calibration of the DT60 ANALYZER, slides for each chemistry are processed with 3 different concentrations or "levels" of Kodak Ektachem DT CALIBRATORS. The measured results obtained by the ANALYZER, indicated as D_R values, are compared with the given concentration values, stored as "Supplementary Assigned Values" (SAVs) in the CDM for that Kit No. of CALIBRATORS. The computer calculates for each calibrated chemistry a CALIBRATION CURVE that is unique for that DT60 ANALYZER.

When tests are processed, the measured D_R value of each patient sample is compared with the CALIBRATION CURVE for a given chemistry to determine the patient result.

In normal calibration, each concentration or "level" of CALIBRATOR should have only one corresponding D_R value. During calibration, the software monitors the D_R values to determine that each value is within the correct range for the corresponding "level" identified when the slide is processed. If the results of normal calibration were indicated in graph, the normal CALIBRATION CURVE would be similar to the line in figure 1.

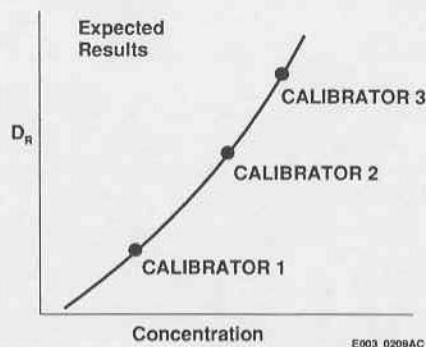


Figure 1 Normal CALIBRATION CURVE

If the D_R values for 2 or more "levels" of CALIBRATOR are within the same range, Error Code C13 is displayed on the printout. The test that caused Error Code C13 must be calibrated again. The test that caused Error Code C13 must be calibrated again. An example of the CALIBRATION CURVE for an "extrema" error is indicated graphically in figure 2.

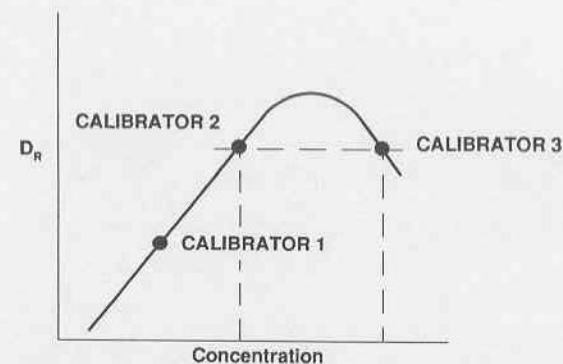


Figure 2 CALIBRATION CURVE for an Extrema Error

IMPORTANT

When possible, customers in the U. S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U. S. and Canada is 800/521-0098.

Error Code C13

To Check for Correct Operation:

The operator should do the calibration procedure again. The error code must not occur.

Possible Causes	Recommended Actions
The operator did not use the correct "levels" of CALIBRATORS, or the CALIBRATORS were not diluted correctly.	The calibration procedure should be done again. Check that the correct "levels" of <i>Kodak Ektachem DT-PLUS</i> CALIBRATORS are used and are diluted correctly. See the Calibration section in the Operator's Manual.
The sample drops are too large or too small.	Do the adjustment for the height of the TIP SEAT. See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual. Do the checkout procedure for the <i>Kodak Ektachem DT</i> PIPETTE. See the Adjustments and Special Procedures, section 8.
The COVER was open when the <i>DT60</i> ANALYZER was calibrated. The SLIDE DISPOSAL BOX was not installed when the <i>DT60</i> ANALYZER was calibrated, and a light leak occurred.	IMPORTANT: The COVER must be closed and the SLIDE DISPOSAL BOX must be installed before the calibration procedure starts. Calibrate the <i>DT60</i> ANALYZER again.

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the Call Report. The customer should be asked to **read** and **sign** the LABEL.

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Error Code C14 — "SLIDE GENERATION ERROR"

Description

When a slide is inserted into a *DT60* ANALYZER that has not been calibrated, the computer compares the information from the BAR CODE with the stored data in the CDM. First, the BAR CODE READER reads and the computer identifies the chemistry of the slide. Next, the "generation" number for the slide is compared with the generation numbers stored in the memory of the CDM. If the CDM has the corresponding generation number stored in the memory, the computer allows the calibration to continue. If a generation number corresponding to the number detected by the BAR CODE READER is not stored in the CDM, Error Code C14 is displayed in the LC DISPLAY.

When **cal mode** is pressed after all slides for a given chemistry have been processed, the computer calculates the calibration parameters. The calculated data and a copy of the calibration data from the CDM are then stored in the NON-VOLATILE RAM to be available for the Test Processing ("Predict") Mode.

When a slide is inserted for test processing in a calibrated *DT60* ANALYZER, the computer compares the information from the BAR CODE with the stored data in the NON-VOLATILE RAM. The BAR CODE READER reads and the computer identifies the slide chemistry. Then the generation number for the slide is compared with the generation numbers stored in the NON-VOLATILE RAM. If the corresponding generation number is stored in the memory of the NON-VOLATILE RAM, the computer allows the test to continue. If a corresponding generation number is not detected in the NON-VOLATILE RAM, Error Code C14 is displayed in the LC DISPLAY.

If a slide is inserted in a calibrated *DT60* ANALYZER when the ANALYZER is operating in the Calibration Mode, the comparison of generation numbers is made between the data from the BAR CODE on the slide and the data stored in the CDM.

NOTE

You can identify the generation number on the LABEL of the box or on the LABEL of each slide package. See figure 2.

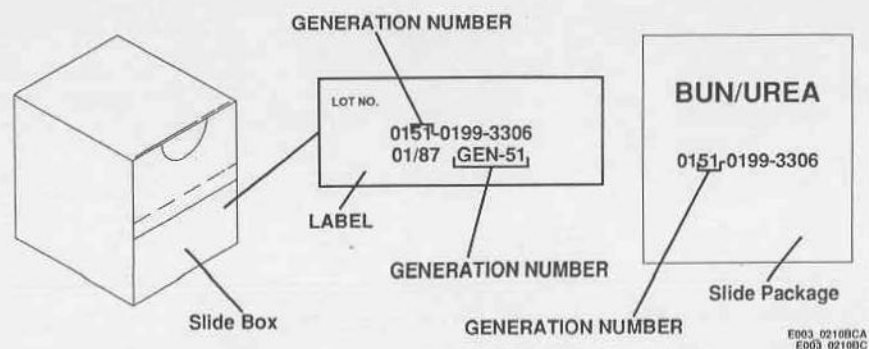


Figure 3 Generation Number: Location on the Slide Box and on the Slide Package

Special Tools and Materials:

Printout from the last calibration

CALIBRATION LABEL, Publication No. XP3100-28

Possible Replacement Parts:

CDM corresponding to the slides available at the customer site

Additional Information:

General Information

"History Chart for Calibration Data Modules (CDM) and Calibration Language Modules (CLM)"

Diagnostics - "Status Code D19"

Operator's Manual - Operating Instructions, Section 2

"Calibration Data Module and Chemistry Language Module"

IMPORTANT

When possible, customers in the U. S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U. S. and Canada is 800/521-0098.

Error Code C14

To Check for Correct Operation:

The operator should do the calibration procedure again. The error code must not occur.

Possible Causes	Recommended Actions
The generation number for the inserted slide is not stored in the memory of the NON-VOLATILE RAM or the CDM.	Determine if Error Code C14 occurred when the DT60 ANALYZER was in the Test Processing ("Predict") Mode or the Calibration Mode.
If Error Code C14 occurred in the Calibration Mode:	
The data in the CDM is not correct for the generation number of the slide that was inserted.	<p>Check, or ask the customer to check that the correct CDM is installed:</p> <ul style="list-style-type: none"> • Enter Option 32. • Press "chemistry select" until the chemistry of the slide is displayed in the LC DISPLAY. • Press "5" to display the generation number of the calibrated chemistry. • Compare the displayed number with the generation number indicated on the slide package or on the slide box. See the figure on page 14. <p>If the CDM is not correct for the chemistry and generation number of the slides, the customer should obtain and install the correct CDM. See the "History Chart" for CDM and CLM in General Information, section 1 of this service manual, or obtain the information from the Customer Support Center in Rochester.</p>
The DT60 ANALYZER is not calibrated for the generation number of the inserted slide.	Calibrate, or ask the customer to calibrate the ANALYZER for the chemistry or chemistries that caused Error Code C14 to occur. If the error occurs again, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

IMPORTANT

If a Kodak employee does the calibration procedure, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the Call Report. The customer should be asked to read and sign the LABEL.

Error Code C14 - Continued

Possible Causes	Recommended Actions
If Error Code C14 occurred in the Test Processing ("Predict") Mode:	
The data in the NON-VOLATILE RAM is not correct for the generation number of the slide that was inserted.	<p>Check for a printout, or ask the customer if a printout is available of the calibration parameters and the generation numbers now in the computer memory. The printout from the last calibration should be stored at the customer site.</p> <p>If no printout is available for the calibration data stored in the computer memory, a full wet calibration should be done for all chemistries used by the customer.</p>
A power malfunction might have cleared the memory in the NON-VOLATILE RAM and caused a Status Code D19.	<p>If a printout of the calibration data is available from the last calibration:</p> <ul style="list-style-type: none"> • Press the MAIN POWER SWITCH to the "0" position, then to the "1" position, to cause a checksum checkout of the NON-VOLATILE RAM. • If Status Code D19 occurs, diagnose and repair the malfunction using the diagnostic information for Status Code D19. • Do the procedure to enter the existing calibration data into the NON-VOLATILE RAM. See "NON-VOLATILE RAM - Obtaining/Clearing/Entering Data" in Adjustments and Special Procedures, section 8 of the service publication.

Error Code C15 — "KIT NO. NOT IN MEMORY"

Description

When the operator enters the Calibration Mode, the system asks for the number of the calibration kit. The operator manually enters the kit number. The computer in the DT60 ANALYZER makes a comparison of the entered number and the data stored in the CDM to determine if a corresponding value is stored in the memory. If the entered kit number has no corresponding value in the CDM, Error Code C15 is displayed in the LC DISPLAY.

IMPORTANT

When possible, customers in the U.S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U.S. and Canada is 800/521-0098.

Error Code C15

To Check for Correct Operation:

The operator should do the calibration procedure again. The error code must not occur.

Possible Causes	Recommended Actions
The operator did not enter the correct kit number.	Do the calibration again, using the correct kit number.
The CDM does not have the necessary data stored in the memory.	Execute option 35, and enter "2" to select the short format for option 34. Execute option 34, and press the "chemistry select" key to select "KN" for kit number. Press "print" to obtain a printout. If the correct kit number is not stored in the CDM, use a different kit, or install a new CDM.

IMPORTANT

If a Kodak employee does the calibration procedure, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the Call Report. The customer should be asked to **read** and **sign** the LABEL.

Error Code C17 — "MISSING LEVEL"

Description

During a calibration procedure, the operator must manually enter the number of the BOTTLE, or "level", when the CALIBRATORS are processed. The software in the DT60 ANALYZER monitors the entered numbers to check that all necessary levels have been entered for each calibrated chemistry. If the operator presses **cal mode** before all expected levels for a chemistry are entered, Error Code C17 is displayed on the printout and the calibration must be done again for that chemistry.

The most frequent cause of Error Code C17 is an operator error.

IMPORTANT

When possible, customers in the U.S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U.S. and Canada is 800/521-0098.

Error Code C17

To Check for Correct Operation:

The operator should do the calibration again. The error code must not occur again.

Possible Causes	Recommended Actions
The operator pressed cal mode before all necessary "levels" of CALIBRATORS were entered for a chemistry being calibrated.	Check the printout to determine if all necessary "levels" of the CALIBRATORS were used for the calibration. Do the calibration again, entering all necessary "levels".

IMPORTANT

If a Kodak employee does the calibration procedure, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the Call Report. The customer should be asked to **read** and **sign** the LABEL.

Error Code C18 — "MONOTONICITY ERROR"

Description

The "levels" of *Kodak Ektachem DT CALIBRATORS* or *Kodak Ektachem DT-PLUS CALIBRATORS* must be processed in the correct sequence. The software in the *DT60 ANALYZER* monitors the data entered during calibration to determine if the CALIBRATORS are processed in the expected sequence. If "levels" of the CALIBRATORS are detected in a different sequence, Error Code C18 is displayed on the printout. Other causes of Error Code C18 might be fluids that were not prepared correctly, the TIP SEAT not adjusted correctly, or a light leakage.

Figure 4 indicates graphically the examples of CALIBRATION CURVES for expected results and for a "monotonicity" error.

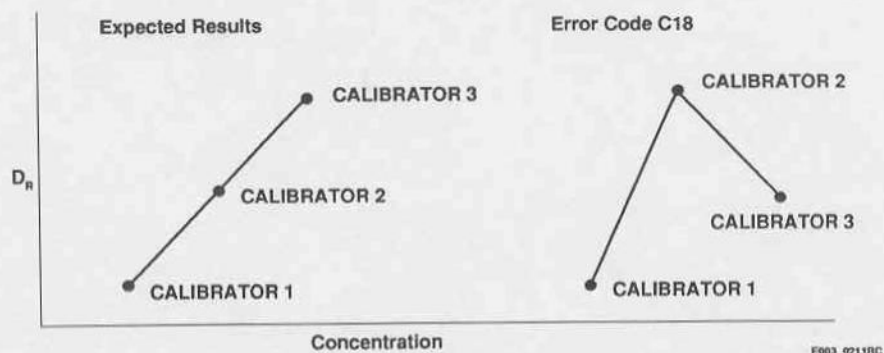


Figure 4 Normal CALIBRATION CURVE and Example of Monotonicity Error

IMPORTANT

When possible, customers in the U.S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U.S. and Canada is 800/521-0098.

Error Code C18

To Check for Correct Operation:

The operator should do the calibration again. The error code must not occur again.

Possible Causes	Recommended Actions
The CALIBRATORS were not processed in the correct sequence. The operator did not enter the data for the "levels" correctly.	Check the printout to determine if the "levels" of CALIBRATORS were entered and processed in the correct sequence.
The CALIBRATORS were not prepared correctly. The concentration of the fluids is not correct.	Check that the fluids were prepared correctly. If necessary, do the calibration again.
The size of the drops is too small or too large.	Check that the adjustment for the height of the TIP SEAT is correct. See the Adjustments and Special Procedures for the <i>DT60 ANALYZER</i> , section 8 of this service manual. Do the checkout procedure for the <i>Kodak Ektachem DT PIPETTE</i> . See the Adjustments and Special Procedures, section 8 in this service manual.
The MAIN COVER was not installed correctly, or the SLIDE DISPOSAL BOX was removed during calibration and a light leakage occurred.	Check that the COVER and the SLIDE DISPOSAL BOX are installed correctly. Do the calibration procedure again.

IMPORTANT

If a Kodak employee does the calibration procedure, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the Call Report. The customer should be asked to read and sign the LABEL.

Error Code C19 — "CDM RECORD FORMAT ERROR"

Description

Each CDM has a "record format" or "data release" number. During initialization, the *DT60* ANALYZER does a software checkout to determine if the number for the CDM is stored in the software memory. If the "record format" or "data release" number for the installed CDM is not compatible with the numbers available in the software memory, Error Code C19 is displayed in the LC DISPLAY.

IMPORTANT

When possible, customers in the U.S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U.S. and Canada is 800/521-0098.

Possible Replacement Parts:

CALIBRATION DATA MODULE (CDM)
CDM/CLM CIRCUIT BOARD ASSEMBLY 613956 — Software Version 9.0
CDM/CLM CIRCUIT BOARD ASSEMBLY 352399 — Software Version 10.7 and above

Error Code C19

To Check for Correct Operation:

Initialize the *DT60* ANALYZER again. The error code must not occur again.

Possible Causes	Recommended Actions
The CDM that is installed in the CDM/CLM BOARD is not compatible with the software in the <i>DT60</i> ANALYZER.	Execute Option 13 to obtain the software version and the record format number. The record format number is the 4 digits displayed in the LC DISPLAY, following "CDM". Provide the information to the Customer Service Center in Rochester. The personnel in Rochester can determine if the installed CDM and the software are compatible. If necessary, install a new, compatible CDM.
The CDM is not seated in the CDM/CLM BOARD.	Seat the CDM and initialize the ANALYZER.
The CDM is damaged.	Install a new CDM.
The CDM/CLM BOARD is damaged.	Repair, if possible, or install a new CDM/CLM BOARD.

Error Code C21 — "INVALID REFERENCE FLUID NUMBER"

Description

When a potentiometric test is calibrated, the message "ENTER REF FLUID GEN NUMBER" is displayed in the LC DISPLAY. The operator should enter the "generation" number of the *Kodak Ektachem* DT ELECTROLYTE REFERENCE FLUID. The operator manually enters the "generation" number that is on the BOTTLE of reference fluid. The entered number is compared with the data in the CDM to determine if a corresponding value is stored. Error Code C21 occurs when the entered value does not have a corresponding value in the CDM.

IMPORTANT

When possible, customers in the U.S. and Canada should first obtain help from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U.S. and Canada is 800/521-0098.

Error Code C21

To Check for Correct Operation:

The operator should do the calibration procedure again. The error code must not occur.

Possible Causes	Recommended Actions
The operator entered the wrong "generation" number for the reference fluid.	The customer should do the calibration again, entering the correct "generation" number.
The CDM does not have the necessary data for the generation of reference fluid used by the customer.	Provide the information to the Customer Service Center in Rochester. The personnel in Rochester can determine if the installed CDM and the "generation" number for the reference fluid are compatible. If necessary, install a new, compatible CDM.

IMPORTANT

If a Kodak employee does the calibration procedure, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the Call Report. The customer should be asked to **read and sign** the LABEL.

Error Code D11 — "CLM MALFUNCTION"

DT60 ANALYZER

Description

IMPORTANT

Error Code D11 occurs only when version 8.4 software is installed. You should install a newer version of software. Check with local personnel in CPD Marketing to determine the correct software for the customer.

Obtain and install the correct CDM and CLM for the new software. If necessary, call the Customer Support Center in Rochester for additional information. The telephone number is 800/521-0098.

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Error Code D12 — "EA PROM ERROR"

DT60 ANALYZER

Description

The "EA PROM" is the NON-VOLATILE RAM on the CPU BOARD or the MASTER BOARD. The NON-VOLATILE RAM stores important data that can change during the operation of the DT60 ANALYZER. If all power is removed from a RAM component, the data in the memory is erased. 2 internal batteries in the NON-VOLATILE RAM on the CPU BOARD, or an external battery on the MASTER BOARD, provide continual voltage when the power is removed from the DT60 ANALYZER. When the DT60 ANALYZER is deenergized, the batteries protect any data stored in the NON-VOLATILE RAM. The NON-VOLATILE RAM is INTEGRATED CIRCUIT U12 in version 9.0 CPU BOARDS, INTEGRATED CIRCUIT U8 in versions 10.7 and 11.0 CPU BOARDS, and INTEGRATED CIRCUIT U36 on the MASTER BOARD.

For correct operation, the internal +5 V dc input power to the CPU BOARD or MASTER BOARD should be +4.85 to +5.15 V dc. If the voltage signal to the microprocessor and other logic components is less than +4.75 V dc, the microprocessor stops, and the NON-VOLATILE RAM operates from the internal battery power. When the battery power is connected, the NON-VOLATILE RAM is locked and will not store new data.

Examples of the data stored in the NON-VOLATILE RAM are:

- correction factors, for colorimetric tests only
- calibration parameters
- reflectance values
- Generation Nos. for calibrated tests
- reporting modes selected by the operator — for example, BUN or UREA and U.S. or S.I. units of measurement
- "post-prediction adjustment values"

When new data must be stored, the microprocessor sends a command signal to write the data into the NON-VOLATILE RAM. Each time new data are written into the NON-VOLATILE RAM, a software checkout procedure is done to read and compare the written data with the original data. In versions 9.0 and 10.7 software, if the one attempt to write data is not successful, Error Code D12 is displayed in the LC DISPLAY and on the printout. In version 11.0 software, if the first attempt to write data is not correct, the microprocessor sends another command signal to write the data, and another software checkout is done. If both checkouts are not correct, Error Code D12 is displayed as for versions 9.0 and 10.7. In all software versions, when Error Code D12 occurs, the operation of the DT60 ANALYZER is stopped and the KEYBOARD is locked so that no data can be entered by an operator. Error Code D12 can occur during the following operations of the DT60 ANALYZER:

- initialization
- Options 29, 30, 32, 63, 64, 73, 81, 83, 92, 93
- calibration mode

Special Tools:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
CONTACT LUBRICANT TL-3773

Possible Replacement Parts

For all serial numbers:

POWER SUPPLY ASSEMBLY 616818
CDM/CLM CIRCUIT BOARD ASSEMBLY — Software Version 9.0
CDM/CLM CIRCUIT BOARD ASSEMBLY 352399 — Software Versions 10.7 and 11.0

For Multi-Board configuration, serial numbers 100 to 6400 only:

INTEGRATED CIRCUIT (NON-VOLATILE RAM) 616767
Type 1 CPU BOARD 613941 — Software Version 9.0
Type 2 CPU BOARD 352616 — Software Versions 10.7 and 11.0
MOTHER BOARD ASSEMBLY 352495

For Single-Board configuration, serial numbers 7000 and above only:

MASTER BOARD ASSEMBLY 352655

Additional Information

Adjustments and Special Procedures — DT60 ANALYZER
NON-VOLATILE RAM — Obtaining/Clearing/Entering Data
POWER SUPPLY — Checkout Procedure
Parts and Removals — DT60 ANALYZER

Specifications

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

To Check for Correct Operation:

To calculate the checksum for the NON-VOLATILE RAM again, initialize the *DT60* ANALYZER after any adjustment, replacement, or other procedure you do to repair the malfunction. To check for an intermittent Error Code D12, initialize the *DT60* ANALYZER 3 or more times, using the MAIN POWER SWITCH or Option 9. Enter all necessary data into the NON-VOLATILE RAM. See the procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data", in the Adjustments and Special Procedures for the *DT60* ANALYZER, section 8 of this service manual.

Possible Causes	Recommended Actions
The internal power in the <i>DT60</i> ANALYZER is not within the specifications.	<ul style="list-style-type: none"> - Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, or the procedure in the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual. - Repair, or install replacement parts as necessary.
The main power at the site is not within the specifications.	Provide the information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the equipment.
The continuity between CONNECTOR P9 on the CDM/CLM BOARD and CONNECTOR J9 on the MOTHER BOARD is intermittent or is not correct.	<ul style="list-style-type: none"> - Remove the CDM/CLM BOARD and check for damaged PINS and CONTACTS on CONNECTORS J9 and P9. If possible, repair any damage. - Seat the CDM/CLM BOARD correctly and install the 2 SCREWS to hold it in position.
CONNECTOR P9 on the CDM/CLM BOARD is damaged.	<ul style="list-style-type: none"> - Repair any damage to CONNECTOR P9. - Install a replacement for the CDM/CLM BOARD.
CONNECTOR J9 on either the MOTHER BOARD or the MASTER BOARD is damaged.	<ul style="list-style-type: none"> - Repair any damage to CONNECTOR J9. - Install a replacement for the MOTHER BOARD or the MASTER BOARD.
Multi-Board Configuration — Version 9.0 Software:	
The NON-VOLATILE RAM, INTEGRATED CIRCUIT U12 on the CPU BOARD, is not seated correctly.	Remove INTEGRATED CIRCUIT U12 and seat it correctly.
The NON-VOLATILE RAM, INTEGRATED CIRCUIT U12 on the CPU BOARD, has a malfunction.	<ul style="list-style-type: none"> - Install a new INTEGRATED CIRCUIT in the U12 position on the CPU BOARD. - Enter the necessary data into the NON-VOLATILE RAM. See the special procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data".

Possible Causes	Recommended Actions
Multi-Board Configuration — Versions 10.7 and 11.0 Software:	
The NON-VOLATILE RAM, INTEGRATED CIRCUIT U8 on the CPU BOARD, is not seated correctly.	Remove INTEGRATED CIRCUIT U8 and seat it correctly.
The NON-VOLATILE RAM, INTEGRATED CIRCUIT U8 on the CPU BOARD, has a malfunction.	<ul style="list-style-type: none"> - Install a new INTEGRATED CIRCUIT in the U8 position on the CPU BOARD. - Enter the necessary data into the NON-VOLATILE RAM. See the special procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data".
For Multi-Board Configuration:	
The CPU BOARD is not fully seated.	Remove the CPU BOARD and install it correctly.
CONNECTOR J1 or J2 on the MOTHER BOARD is damaged.	<ul style="list-style-type: none"> - Remove the CPU BOARD and check CONNECTORS J1 and J2 for damage. - Check the CONTACTS adjacent to the LOCATING CLIPS for any indication of damage. - Repair any damage, or install a replacement for the MOTHER BOARD if necessary. See Parts and Removals for the <i>DT60</i> ANALYZER. - Install the CPU BOARD.
The CPU BOARD has a malfunction.	Install a replacement for the CPU BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER.
The MOTHER BOARD has a malfunction.	Install a replacement for the MOTHER BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER.
For Single-Board Configuration:	
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER.

Error Code D13 — "PROM CHECKSUM ERROR"

DT60 ANALYZER

Description

Most of the software program for the DT60 ANALYZER and the DTE MODULE is in the PROGRAMMED ROMS on the CPU BOARD in Multi-Board configuration, or on the MASTER BOARD in Single-Board configuration. The data in these PROGRAMMED ROMS does not change. The computer uses checksum procedures to check and protect the data. A checksum is calculated by adding the values of the memory locations for a PROGRAMMED ROM in a special order or protocol. The original calculated value is stored in another memory location as a part of the software program. During initialization, the checksums are calculated and compared with the stored checksums. If checksums calculated during initialization are not the same as the corresponding stored checksums, Error Code D13 is displayed on the printout with a letter or number code to indicate the component with the problem. The following table indicates the codes and the locations of the components represented by the codes:

Codes and Component Locations for Error Code D13

Alphanumeric Codes used with the message: "ERROR IN PROM ____"		Component Location			
		Multi-Board Configuration			Single-Board Configuration
		9.0	10.7	11.0	11.0
PROGRAMMED ROMS	1	CPU, U1	CPU, U5	CPU, U5	MASTER BOARD, U6
	2	CPU, U2	CPU, U6	CPU, U6	MASTER BOARD, U14
	3	CPU, U3	-----	-----	-----
	4	CPU, U4	-----	-----	-----
	5	CPU, U5	-----	-----	-----
1/2 of CLM	C	CLM	CLM	CLM	CLM
1/2 of CLM	D	-----	CLM	CLM	CLM
CDM	M	-----	-----	CLM	CLM
NON-VOLATILE RAM	R	CPU, U12	CPU, U8	CPU, U8	MASTER BOARD, U36

When Error Code D13 occurs, the operation of the DT60 ANALYZER is stopped and the KEYBOARD is locked so that no data can be entered by an operator. Error Code D13 can occur during the following operations of the DT60 ANALYZER:

- initialization
- operating, or "Predict", mode
- Options 29, 30, 32, 63, 64, 73, 81, 83, 92, 93
- calibration mode

Special Tools:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
CONTACT LUBRICANT TL-3773

Possible Replacement Parts

For all serial numbers:

POWER SUPPLY ASSEMBLY 616818
CDM/CLM CIRCUIT BOARD ASSEMBLY — Software Version 9.0
CDM/CLM CIRCUIT BOARD ASSEMBLY 352399 — Software Versions 10.7 and 11.0

IMPORTANT

If a new CDM or CLM is necessary, the customer should obtain it. For additional information or help, speak with either local CPD Marketing personnel or personnel in the Clinical Products Customer Support Center in Rochester. The telephone number is 800/521-0098.

For Multi-Board configuration, serial numbers 100 to 6400 only:

INTEGRATED CIRCUIT (NON-VOLATILE RAM) 616767
INTEGRATED CIRCUIT (PROGRAMMED ROM 1) 352806, at U5 on the CPU BOARD
INTEGRATED CIRCUIT (PROGRAMMED ROM 2) 352807, at U6 on the CPU BOARD
Type 1 CPU BOARD 613941 — Software Version 9.0
Type 2 CPU BOARD 352616 — Software Versions 10.7 and 11.0
MOTHER BOARD ASSEMBLY 352495

For Single-Board configuration, serial numbers 7000 and above only:

BATTERY 227322
MASTER BOARD ASSEMBLY 352655

Additional Information

Adjustments and Special Procedures — DT60 ANALYZER
NON-VOLATILE RAM — Obtaining/Clearing/Entering Data
POWER SUPPLY — Checkout Procedure

Diagrams — DT60 ANALYZER

Parts and Removals — DT60 ANALYZER

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

Error Code D13 — "PROM CHECKSUM ERROR"

To Check for Correct Operation:

To calculate the checksum for the NON-VOLATILE RAM again, initialize the DT60 ANALYZER after any adjustment, replacement, or other procedure you do to repair the malfunction. Enter all necessary data into the NON-VOLATILE RAM. See the procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data", in the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual. Check for an intermittent Error Code D13.

Possible Causes	Recommended Actions
The internal power in the DT60 ANALYZER is not within the specifications.	<ul style="list-style-type: none"> - Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, or the procedure in the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual. - Repair, or install replacement parts as necessary.
The main power at the site is not within the specifications.	Provide the information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the equipment.

NOTE

To use the following diagnostic table, first identify the component that has a malfunction. See the "Codes and Component Locations for Error Code D13" table on page 34.

Possible Causes	Recommended Actions
If the malfunctioning component is on the CDM/CLM BOARD, check:	
A DT60 ANALYZER with version 9.0 or 10.7 software was energized when the CDM and CLM are not installed.	Install the CDM or the CLM as necessary.
The continuity between CONNECTOR P9 on the CDM/CLM BOARD and CONNECTOR J9 on the CDM/CLM BOARD is intermittent or is not correct.	Remove the CDM/CLM BOARD and check for damaged PINS and CONTACTS on CONNECTORS J9 and P9. If possible, repair any damage.
The indicated INTEGRATED CIRCUIT is not seated correctly.	Remove the INTEGRATED CIRCUIT and seat it correctly.
The indicated INTEGRATED CIRCUIT has a malfunction.	Install a replacement for the INTEGRATED CIRCUIT. See the table on page 34.
The CDM/CLM BOARD is not seated correctly.	Seat the CDM/CLM BOARD correctly and install the 2 SCREWS to hold it in position.
The CDM/CLM BOARD has a malfunction.	Install a replacement for the CDM/CLM BOARD.
CONNECTOR P9 on the CDM/CLM BOARD is damaged.	<ul style="list-style-type: none"> - Repair any damage to CONNECTOR P9. - Install a replacement for the CDM/CLM BOARD.
CONNECTOR J9 on the MOTHER BOARD is damaged.	<ul style="list-style-type: none"> - Repair any damage to CONNECTOR J9. - Install a replacement for the MOTHER BOARD.
If the malfunctioning component is not on the CDM/CLM BOARD, check:	
The indicated INTEGRATED CIRCUIT is not seated correctly.	Remove the INTEGRATED CIRCUIT and seat it correctly.
The indicated INTEGRATED CIRCUIT has a malfunction.	<ul style="list-style-type: none"> - If the part is available, install a replacement for the INTEGRATED CIRCUIT. - If the part is not available, install a replacement for the CIRCUIT BOARD.

Error Code D14 — "RAM MALFUNCTION"

DT60 ANALYZER

Description

RAM components on the CPU BOARD in Multi-Board configuration, or on the MASTER BOARD in Single-Board configuration, are used to store temporary data during operation. When the *DT60* ANALYZER is deenergized, any data stored in RAM is erased.

NOTE

On software version 9.0 CPU BOARDS, the RAM components are at U13 — U15.

On CPU BOARDS with software versions 10.7 and 11.0, the RAM components are at U1 — U3.

On the MASTER BOARD, the RAM components are soldered in position and cannot be removed.

During initialization or when Option 9 is executed, the microprocessor does a software checkout procedure to check the function of the RAM components. A series of patterns is stored in the software program. The microprocessor writes these patterns into the RAM memory. Then the microprocessor reads and compares the written data with the original data. If the new and original data are not the same, the checkout is not successful.

In versions 9.0 and 10.7 software, Error Code D14 is displayed in the LC DISPLAY if the first checkout is not successful. In version 11.0 software, if the first checkout is not correct, the microprocessor sends a command signal to do another software checkout. Error Code D14 is displayed only after both checkouts are not successful. In all software versions, when Error Code D14 occurs, the operation of the *DT60* ANALYZER is stopped and the KEYBOARD is locked so that no data can be entered by an operator. Error Code D14 can occur during the following operation of the *DT60* ANALYZER:

- initialization
- Option 9

Special Tools:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
CONTACT LUBRICANT TL-3773

Possible Replacement Parts

For all serial numbers:

POWER SUPPLY ASSEMBLY 616818

For Multi-Board configuration, serial numbers 100 to 6400 only:

Type 1 CPU BOARD 613941 — Software Version 9.0

Type 2 CPU BOARD 352616 — Software Versions 10.7 and 11.0

MOTHER BOARD ASSEMBLY 352495

For Single-Board configuration, serial numbers 7000 and above only:

MASTER BOARD ASSEMBLY 352655

Additional Information

Adjustments and Special Procedures — *DT60* ANALYZER

NON-VOLATILE RAM — Obtaining/Clearing/Entering Data

POWER SUPPLY — Checkout Procedure

Diagrams — *DT60* ANALYZER

Parts and Removals — *DT60* ANALYZER

Specifications

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

To Check for Correct Operation:

To determine if the writing and reading functions of the RAM operate correctly, initialize the *DT60* ANALYZER after any adjustment, replacement, or other procedure you do to repair the malfunction. To check for an intermittent Error Code D14, initialize the *DT60* ANALYZER several times. Execute Option 9, or use the MAIN POWER SWITCH, or SWITCH S1 on the CPU BOARD or the MASTER BOARD, to reset the ANALYZER. If necessary, enter all necessary data into the NON-VOLATILE RAM. See the procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data", in the Adjustments and Special Procedures for the *DT60* ANALYZER, section 8 in this service manual.

Possible Causes	Recommended Actions
The internal power in the <i>DT60</i> ANALYZER is not within the specifications.	<ul style="list-style-type: none"> - Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, or the procedure in the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual. - Repair, or install replacement parts as necessary.
The main power at the site is not within the specifications.	Provide the information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the equipment.
For Multi-Board Configuration:	
The CPU BOARD is not fully seated.	Remove the CPU BOARD and install it correctly.
CONNECTOR J1 or J2 on the MOTHER BOARD is damaged.	<ul style="list-style-type: none"> - Remove the CPU BOARD and check CONNECTORS J1 and J2 for damage. - Check the CONTACTS adjacent to the LOCATING CLIPS for any indication of damage - Repair any damage, or install a replacement for the MOTHER BOARD if necessary. See Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual. - Check for the following possible cause before installing the CPU BOARD.
The RAM components on the CPU BOARD are not seated correctly.	<ul style="list-style-type: none"> - If they can be removed, remove the RAM components and install them again, checking that they are seated correctly. <p>NOTE: On version 9.0 CPU BOARDS, the RAM components are located at U1 — U5. On versions 10.7 and 11.0 CPU BOARDS, the RAM components are located at U5 and U6.</p> <ul style="list-style-type: none"> - Install the CPU BOARD.
The CPU BOARD has a malfunction.	Install a replacement for the CPU BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual.
The MOTHER BOARD has a malfunction.	Install a replacement for the MOTHER BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER.

Possible Causes	Recommended Actions
For Single-Board Configuration:	
The CONNECTORS on the MASTER BOARD are not seated correctly, or they are damaged.	Disconnect the CONNECTORS on the MASTER BOARD. Check them for damage, and repair them as necessary. Connect the CONNECTORS and seat them correctly.
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual.

Error Code D15 — "CORRECTION FACTORS ERROR"

DT60 ANALYZER

Description

During the procedure to revise the correction factors, if the computer calculates values that are not within the expected limits in the software, an Error Code D15 is displayed on the printout. If the values used by the computer for the calculation are excessively high or low, the result will not be within the expected limits. With software versions 9.0 and 10.7, Option 83 is executed to calculate new correction factors. Option 29 is used for software version 11.0. Error Code D15 occurs only after **cal mode** is pressed to calculate the new correction factors.

Only 3 conditions can cause an Error Code D15:

- an operator error,
- a black or white reading that is not within the limits, or
- a computer malfunction.

The most frequent cause of Error Code D15 is operator error. For example, the values indicated on the packages of WHITE REFERENCE SLIDES and BLACK REFERENCE SLIDES might not be entered correctly. The REFERENCE SLIDE might not be inserted or identified correctly by the operator. The **chemistry select** KEY should be used to display either "WRDT" for the WHITE REFERENCE SLIDE, or "BRDT" for the BLACK REFERENCE SLIDE.

Another possible operator error is using only one of the REFERENCE SLIDES for an LED. A black reference value and a white reference value must be obtained for each LED. For additional information, see the procedures to revise the correction factors in the Adjustments and Special Procedures, section 8 of this service manual.

Special Tools:

WHITE REFERENCE SLIDE TL-3344 with the labelled box
BLACK REFERENCE SLIDE TL-3345 with the labelled box

Possible Replacement Parts

LOWER RACK ASSEMBLY 352543
LOWER RACK ASSEMBLY 352434, Modification No. 6

Additional Information:

Options

Adjustments and Special Procedures — DT60 ANALYZER

Correction Factors — Versions 9.0/10.7 Software

Correction Factors — Version 11.0 Software

HOME SENSOR/LOWER RACK — Alignment

UPPER RACK — Alignment

LOWER ARM — Alignment

UPPER ARM — Height

Parts and Removals — DT60 ANALYZER

Specifications for the Adjustment of the HOME SENSOR and LOWER RACK:

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at step +86, and
- move down off the TRAILING EDGE of the slide at step +87, +88, or +89.

Specifications for the Adjustment of the UPPER RACK:

Execute Option 68 for -59 steps, and measure 0.152 to 1.54 mm (0.005 to 0.023 in.) between the PUSHER FINGER and the INCUBATOR.

Specifications for the Adjustment of the LOWER ARM:

- When the UPPER RACK is in the Home Position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance, and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

Specifications for the Adjustment of the Height of the UPPER ARM:

When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

NOTE

For a Type 1 PRESSURE PAD, the step count is 20.

For a Type 2 PRESSURE PAD, the step count is 70.

With the RACKS in the Home Position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

Error Code D15

To Check for Correct Operation:

To check that Error Code D15 does not occur again, do the procedure to revise the correction factors. If "NEW CORRECTION FACTORS" and the new values are displayed on the printout, this diagnostic is completed. If Error Code D15 occurs again after you have checked the items in the diagnostic table, obtain help from TAC in Rochester.

Possible Causes	Recommended Actions
Operator Errors	
The values entered for "slide reflectances" were not correct.	<ul style="list-style-type: none"> - Enter Option 36 to obtain the reflectance values for the colorimetric chemistries. - Compare the values on the printout with the values indicated on the slide boxes. - If necessary, do the Correction Factors procedure again. Check that the "slide reflectance" values, including the decimal point, are entered correctly.
The REFERENCE SLIDES were not identified correctly, or only one REFERENCE SLIDE was used.	Do the Correction Factors procedure again. Check that you press chemistry select to identify the WHITE and BLACK REFERENCE SLIDES. Use both REFERENCE SLIDES for the procedure.
Error in White Reference or Black Reference Reading	
The REFERENCE SLIDE is dirty.	Use a new REFERENCE SLIDE and do the Correction Factors procedure again.
The WHITE REFERENCE TARGET on the LOWER RACK is dirty or has been removed.	<ul style="list-style-type: none"> - Deenergize the DT60 ANALYZER. - Move the LOWER RACK to the eject position. - Check the condition of the WHITE REFERENCE TARGET. - If the TARGET is dirty or is removed from the LOWER RACK, install a replacement for the LOWER RACK. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual. <p>IMPORTANT: If a replacement for the LOWER RACK is installed, do the following adjustments and procedures in the given sequence:</p> <p>HOME SENSOR/LOWER RACK UPPER RACK UPPER ARM LOWER ARM DR Procedure*</p> <p>IMPORTANT: *If the DR values are not within the given limits, do:</p> <p>Correction Factors procedure Full calibration for all chemistries used by the customer.</p>

Error Code D15 - Continued

Possible Causes	Recommended Actions
A malfunction occurred in the CIRCUIT BOARDS or the logic components.	Computer Errors
	<ul style="list-style-type: none"> - Check to see if an Error Code D12, D13, or D14 was displayed with Error Code D15. If another "D" code was displayed, diagnose for that error. - If no other "D" code is displayed with Error Code D15, reset the ANALYZER. To reset, use one of the following: <ul style="list-style-type: none"> • Option 9 • SWITCH S1, on either the CPU BOARD or the MASTER BOARD • MAIN POWER SWITCH - Do the Correction Factors procedure again.

Error Code D16 — "MATH ERROR"

DT60 ANALYZER

Description

Error Code D16 occurs when the microprocessor is not able to calculate a value in the operating mode, the service mode, or the calibration mode. The software stops any calculation that uses 0 (zero) as the value for a divisor, or that attempts to obtain the logarithm or square root value for a negative value.

Error Code D16 is usually caused by an action that clears the memory in the NON-VOLATILE RAM. The memory is cleared when an Option 73 is executed or when Status Code D19 occurs. The following values are changed when the data in the NON-VOLATILE RAM are deleted:

- All values for the correction factors are changed to 0 (zero).
- All Generation Nos. stored in the NON-VOLATILE RAM for any calibrated chemistries are changed to "-1". The Generation Nos. stored in the CDM are not changed.

NOTE

- If an operator starts a calibration procedure after the memory is cleared, the correction factor values of 0 are used in the calibration calculation.
- If the operator starts to process slides following an Option 73 or a Status Code D19, an Error Code C14 is displayed.
- When slides are processed in the operating mode or the service mode, the slide Generation Nos. are compared with the Generation Nos. stored in the NON-VOLATILE RAM. In the calibration mode, the Generation Nos. stored in the CDM are used for the comparison.

Error Code D16 might also be caused by excessively high or low concentrations of TRIG or another chemistry in the sample fluid, the control fluid, or the CALIBRATORS. If D16 occurs with only one chemistry, obtain help from the Customer Support Center. The telephone number is 800/521-0098.

Special Tools and Materials:

WHITE REFERENCE SLIDE TL-3344 with the labelled box
BLACK REFERENCE SLIDE TL-3345 with the labelled box
Kodak Ektachem DT CONTROLS

Possible Replacement Parts

None

Additional Information:

Adjustments and Special Procedures — DT60 ANALYZER

D_R Procedure — Versions 9.0/10.7 Software

D_R Procedure — Version 11.0 Software

NON-VOLATILE RAM — Obtaining/Clearing/Entering Data

Error Code D16

To Check for Correct Operation:

Do the D_R Procedure and process Kodak Ektachem DT CONTROLS. The D_R Procedure must be successful, and the results of processing the control fluids must be within the range indicated on the "control sheet".

Possible Causes	Recommended Actions
The correction-factor values stored in the NON-VOLATILE RAM are "0" (zero).	<ul style="list-style-type: none">- Check the printout for a Status Code D19. If D19 occurred, check for Error Code D12 or D13. Use the diagnostic for D12 or D13 if either error code is displayed.- Execute Option 36 to obtain the stored correction-factor values from the NON-VOLATILE RAM.- If the correction-factor values are "0", do the procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data". See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.

Error Code D17 — "CLM ERROR CHECK"

DT60 ANALYZER

Description

IMPORTANT

Error Code D17 occurs only when version 8.4 software is installed. Call the Customer Support Center in Rochester for more information. The telephone number is 800/521-0098.

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Error Code D18 — "15 REPLICAS ONLY"

DT60 ANALYZER

Description

IMPORTANT

Error Code D18 occurs when more than 15 values are calculated for one memory location during either the Correction Factors procedure or calibration.

For the Correction Factors procedure, each LED has a given memory location. The "LED OFF" condition also has a given memory location. When the Correction Factors procedure is executed, an operator can select the number of replicates* for each LED color and for the "LED OFF" condition. Because each replicate includes a reading of a WHITE REFERENCE SLIDE and a BLACK REFERENCE SLIDE, the maximum number of replicates allowed by the software is 7: $2 \times 7 = 14$. If 8 or more replicates are selected, Error Code D18 will occur: $2 \times 8 = 16$.

During calibration, each chemistry has a given memory location. If more than 15 slides of one chemistry are used, Error Code D18 will occur. For example, if 3 levels** of Kodak Ektachem DT CALIBRATORS are necessary to calibrate for a given chemistry, the software limits allow a maximum of 5 replicates* for each level: $3 \times 5 = 15$. If 6 replicates are used for each of 3 levels, the software limits for that chemistry are exceeded and Error Code D18 will occur: $3 \times 6 = 18$.

Error Code D18 is usually caused by an operator error.

NOTE

* Replicate = more than one reading selected for a given LED, or for the "LED OFF" condition during the Correction Factors procedure, or more than one slide used for a given chemistry and level of CALIBRATOR during the calibration procedure.

** Level = the concentration of a CALIBRATOR fluid.

Special Tools and Materials:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
CONTACT LUBRICANT TL-3773

Possible Replacement Parts

POWER SUPPLY ASSEMBLY 616818

Additional Information:

Adjustments and Special Procedures — DT60 ANALYZER

Applying CONTACT LUBRICANT TL-3773

POWER SUPPLY — Checkout Procedure

Diagrams — DT60 ANALYZER

Parts and Removals — DT60 ANALYZER

Specifications

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

Error Code D18

To Check for Correct Operation:

Do the Correction Factors procedure or the calibration procedure again. Error Code D18 should not occur again.

Possible Causes	Recommended Actions
Too many replicates were indicated for the Correction Factors procedure, or for a given chemistry during calibration.	<ul style="list-style-type: none">- Do the Correction Factors procedure or the calibration procedure again.- Check that a total of no more than 15 replicates is indicated for a given chemistry, or for each LED and the "LED OFF" condition.- If the number of replicates selected was 15 or less and Error Code D18 occurs again, check the following item in this table.
The internal power in the DT60 ANALYZER is not within the specifications.	<ul style="list-style-type: none">- Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, or in the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.- Repair, or install replacement parts as necessary.
The main power at the customer site is not within the operating specifications for the DT60 ANALYZER.	<ul style="list-style-type: none">- Provide the information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the equipment.- Do the Correction Factors procedure or the calibration procedure again. If Error Code D18 occurs again, obtain help from the Technical Assistance Center in Rochester.

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Status Code D19 — "MEMORY RESET"

DT60 ANALYZER

Description

When the stored data for the correction factors and the calibration values are cleared from the NON-VOLATILE RAM, Status Code D19 is displayed on the printout. Status Code D19 occurs automatically after Error Codes D12 and D13, and after Option 73 is executed. In versions 9.0 and 10.7 software, Status Code D19 might also occur if the DT60 ANALYZER is energized when the CDM or CLM is removed.

Special Tools:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
CONTACT LUBRICANT TL-3773

Possible Replacement Parts

For all serial numbers:

POWER SUPPLY ASSEMBLY 616818
CDM/CLM CIRCUIT BOARD ASSEMBLY — Software Version 9.0
CDM/CLM CIRCUIT BOARD ASSEMBLY 352399 — Software Versions 10.7 and 11.0

IMPORTANT

If a new CDM or CLM is necessary, the customer should obtain it. For additional information or help, speak with either local CPD Marketing personnel or personnel in the Clinical Products Customer Support Center in Rochester. The telephone number is 800/521-0098.

For Multi-Board configuration, serial numbers 100 to 6400 only:

INTEGRATED CIRCUIT (NON-VOLATILE RAM) 616767
INTEGRATED CIRCUIT (PROGRAMMED ROM 1) 352806, at U5 on the CPU BOARD
INTEGRATED CIRCUIT (PROGRAMMED ROM 2) 352807, at U6 on the CPU BOARD
Type 1 CPU BOARD 613941 — Software Version 9.0
Type 2 CPU BOARD 352616 — Software Versions 10.7 and 11.0
MOTHER BOARD ASSEMBLY 352495

For Single-Board configuration, serial numbers 7000 and above only:

BATTERY 227322
MASTER BOARD ASSEMBLY 352655

Additional Information

Adjustments and Special Procedures — DT60 ANALYZER

NON-VOLATILE RAM — Obtaining/Clearing/Entering Data

POWER SUPPLY — Checkout Procedure

Diagrams — DT60 ANALYZER

Parts and Removals — DT60 ANALYZER

Specifications

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

To Check for Correct Operation:

To calculate the checksum for the NON-VOLATILE RAM again, initialize the *DT60* ANALYZER after any adjustment, replacement, or other procedure you do to repair the malfunction. To check for an intermittent Error Code D13, initialize the ANALYZER several times, using the MAIN POWER SWITCH or Option 9. Enter all necessary data into the NON-VOLATILE RAM. See the procedure, "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data", in the Adjustments and Special Procedures for the *DT60* ANALYZER, section 8 in this service manual.

Possible Causes	Recommended Actions
The internal power in the <i>DT60</i> ANALYZER is not within the specifications.	<ul style="list-style-type: none"> - Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, or the procedure in the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual. - Repair, or install replacement parts as necessary.
The main power at the site is not within the specifications.	Provide the information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the equipment.
<p align="center">NOTE</p> <p align="center">Check the printout for Error Code D12 or D13. Diagnose for that code.</p>	
The continuity between CONNECTOR P9 on the CDM/CLM BOARD and CONNECTOR J9 on the MOTHER BOARD is intermittent or is not correct.	<ul style="list-style-type: none"> - Remove the CDM/CLM BOARD and check for damaged PINS and CONTACTS on CONNECTORS J9 and P9. If possible, repair any damage. - Seat the CDM/CLM BOARD correctly and install the 2 SCREWS to hold it in position.
CONNECTOR P9 on the CDM/CLM BOARD is damaged.	<ul style="list-style-type: none"> - Repair any damage to CONNECTOR P9. - Install a replacement for the CDM/CLM BOARD.
CONNECTOR J9 on either the MOTHER BOARD or the MASTER BOARD is damaged.	<ul style="list-style-type: none"> - Repair any damage to CONNECTOR J9. - Install a replacement for the MOTHER BOARD or the MASTER BOARD.
<p align="center">Multi-Board Configuration — Version 9.0 Software:</p>	
The NON-VOLATILE RAM, located at "U12" on the CPU BOARD, is not seated correctly.	Remove the INTEGRATED CIRCUIT at "U12" and seat it correctly.
The NON-VOLATILE RAM, located at "U12" on the CPU BOARD, has a malfunction.	<ul style="list-style-type: none"> - Install a new INTEGRATED CIRCUIT in the "U12" position on the CPU BOARD. - Enter the necessary data into the NON-VOLATILE RAM. See "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data" in the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.

Possible Causes	Recommended Actions
<p align="center">Multi-Board Configuration — Versions 10.7 and 11.0 Software:</p>	
The NON-VOLATILE RAM, located at "U8" on the CPU BOARD, is not seated correctly.	Remove the INTEGRATED CIRCUIT at "U8" and seat it correctly.
The NON-VOLATILE RAM, located at "U8" on the CPU BOARD, has a malfunction.	<ul style="list-style-type: none"> - Install a new INTEGRATED CIRCUIT in the "U8" position on the CPU BOARD. - Enter the necessary data into the NON-VOLATILE RAM. See "NON-VOLATILE RAM — Obtaining/Clearing/Entering Data" in the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.
<p align="center">For Multi-Board Configuration:</p>	
The CPU BOARD is not fully seated.	Remove the CPU BOARD and install it correctly.
CONNECTOR J1 or J2 on the MOTHER BOARD is damaged.	<ul style="list-style-type: none"> - Remove the CPU BOARD and check CONNECTORS J1 and J2 for damage. - Check the CONTACTS adjacent to the LOCATING CLIPS for any indication of damage. - Repair any damage, or install a replacement for the MOTHER BOARD if necessary. See Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual. - Install the CPU BOARD.
The CPU BOARD has a malfunction.	Install a replacement for the CPU BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual.
The MOTHER BOARD has a malfunction.	Install a replacement for the MOTHER BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER.
<p align="center">For Single-Board Configuration:</p>	
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD. See Parts and Removals for the <i>DT60</i> ANALYZER.

Error Code D20 — "DATA LOGGER"

DT60 ANALYZER

Description

Option 66 enables a function that is used only by personnel in KAD. This function is not normally used by field personnel. If Option 66 is executed accidentally by an operator, use the MAIN POWER SWITCH to reset the *DT60 ANALYZER*. No additional action should be necessary.

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Error Codes E11, E12, E15, E16, and E17 — "RESULTS INVALID"

DTE MODULE

Description

When any potentiometric slide is processed, the ELECTROMETER makes 3 consecutive readings each of:

- an internal reference voltage,
- an internal offset voltage, and,
- an external voltage of the slide through the CONTACTS.

The 3 groups of readings occur within milliseconds of each other. This diagnostic is related only to the internal readings. See the diagnostic procedure, "Error Codes E13 and E19", for a description of slide readings.

When the DT60 ANALYZER is in the service mode and Option 43 is executed, internal reference and offset readings are made and used to calculate a gain value.

In versions 9.0 and 10.7 software, the "REF" and "OFST" values on the Option 43 printout are not the same as the actual values used by the DT60 ANALYZER for the calculation. The "GAIN" value displayed on the Option 43 printout is the same as the result calculated by the computer. Accurate values for the reference and offset readings can be obtained by doing the Reference and Offset Checkout Procedure. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.

In version 11.0 software, the "REF" and "OFST" values on the Option 43 printout are the same as the values used by the computer for the calculation. The Reference and Offset Checkout Procedure is recommended as the standard procedure to obtain reference and offset values for all versions of software.

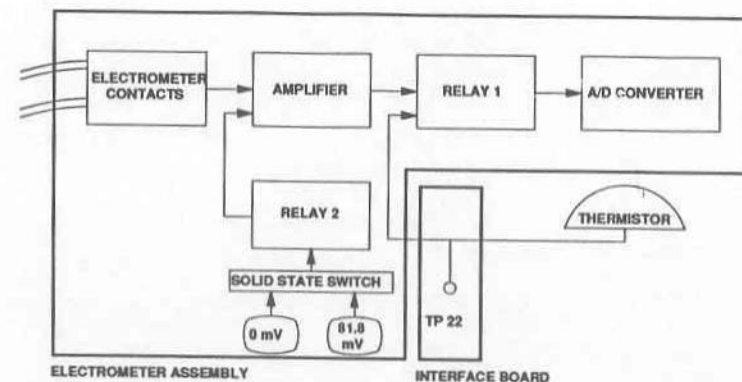
Reference Voltage: To obtain the reference voltage, a RELAY in the ELECTROMETER is connected to an internal voltage signal of approximately 81.8 mV dc. See the figure on page 61. 3 reference readings are made within milliseconds of each other. The purpose of the reference readings is to obtain a given high value, similar to the purpose of the white reference reading for colorimetric tests.

Offset Voltage: To obtain the offset voltage, the RELAY is connected to an internal voltage signal of approximately 0 ± 1.25 mV dc. See the figure on page 61. 3 offset readings are made within milliseconds of each other. The purpose of the offset readings is to obtain a given low value, similar to the purpose of the black reference reading for colorimetric tests.

Calculation of the Gain The reference value and the offset value are used to calculate the gain. The gain is necessary for accurate test results. The following formula indicates the calculation of the gain.

$$\text{Gain} = \frac{(\text{Reference mV} - \text{Offset mV})}{81.8 \text{ mV}}$$

Comparison of A/D Values The A/D CONVERTER in the ELECTROMETER changes the data for each reading from mV to A/D units. The computer in the DT60 ANALYZER receives the A/D value. To check that the electronics in the ELECTROMETER are stable, the A/D results for each group of readings are compared.



Block Diagram — ELECTROMETER

Variations in the Internal Voltage Readings

Error Codes E11 and E12 indicate rapid variations in the internal voltage readings from the electronics in the ELECTROMETER. The malfunction might be in the ELECTROMETER ASSEMBLY or in the circuits leading to it.

Error Code E11

During slide processing, if the 3 reference readings are not within 30 A/D units of each other, Error Code E11 is indicated on the printout and the test results are not displayed. The slide must be processed again.

Error Code E12

During slide processing, if the 3 offset readings are not within 30 A/D units of each other, Error Code E12 is indicated on the printout and the test results are not displayed. The slide must be processed again.

Internal Readings or Gain — Not within the Limits

In the "Service Mode", Option 43 can be used to check the electrical operation of the ELECTROMETER. During Option 43, if any reading is not within the expected range, Status Code E14 is displayed on the printout and in the LC DISPLAY. An additional error code is displayed to provide more information.

IMPORTANT

Option 43 is not a full checkout for the ELECTROMETER. Additional diagnostic checkout is recommended. See the information in the box on page 60.

If Status Code E14 occurs during Option 43, do not use "E14" as a Purpose Code for SCAN. Check for an Error Code E15, E16, or E17. Diagnose and use that code for SCAN.

Status Code E14 and Error Codes E15, E16, and E17 indicate values for the internal readings or the gain that are not within the software limits. All 4 codes can occur during Option 43. For this group of codes, the malfunction might be in the ELECTROMETER ASSEMBLY or in the circuits leading to it.

Error Code E14 and Error Code E16 can also occur during slide processing. If Error Code E14 occurs during slide processing, use the separate diagnostic for that code.

If Error Code E16 occurs during slide processing, the malfunction might be in the ELECTROMETER ASSEMBLY or in the circuits leading to it. Use this diagnostic for Error Code E16 any time that code is displayed.

Error Code E15

During Option 43, if the voltage for the offset is not within -30 to +30 mV, Error Code E15 is indicated on the printout. The offset value displayed during Option 43 is not valid. The Reference and Offset Checkout Procedure will provide accurate results. Error Code E14 usually occurs before an Error Code E15. Use "E15", not "E14", for technical feedback to SCAN.

Error Code E16

Error Code E16 can occur after Option 43 and Error Code E14, or when potentiometric slides are processed. If the value for the reference is not within -1500 to -1700 A/D units, Error Code E16 is indicated on the printout. If Error Code E16 occurred after Option 43 was executed, Error Code E14 should occur before an Error Code E16. Use "E16", not "E14", for technical feedback to SCAN.

If Error Code E16 occurred during slide processing, Error Code E16 and "RESULTS INVALID" are displayed on the printout and the test results are not displayed. The slide must be processed again.

Error Code E17

During Option 43, if the value for the calculated gain is not within -21.5 to -24.0, Error Code E17 is indicated on the printout. If Error Code E17 occurred after Option 43 was executed, Error Code E14 should occur before an Error Code E17. Use "E17", not "E14", for technical feedback to SCAN.

Special Tools:

FORS ADJUSTMENT BOARD TL-3340

MULTIMETER TL-3424

3 new or used potentiometric slides

Possible Replacement Parts, DTE MODULE:

ELECTROMETER BOX ASSEMBLY, Type 2, 351800

INTERFACE CIRCUIT BOARD ASSEMBLY, Type 1, 617151

INTERFACE CIRCUIT BOARD ASSEMBLY, Type 2, 351554

MAIN POWER CABLE 617159

Possible Replacement Parts, DT60 ANALYZER:

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software in Multi-Board Configuration

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 10.7 Software and above in Multi-Board Configuration

MOTHER BOARD ASSEMBLY 352495, for Multi-Board Configuration

MASTER BOARD ASSEMBLY 352655, for Single-Board Configuration

Additional Information

Adjustments and Special Procedures — DTE MODULE

NON-VOLATILE RAM — Obtaining/Clearing/Entering Data

POWER SUPPLY — Checkout Procedure

Diagrams — DT60 ANALYZER and DTE MODULE

Parts and Removals — DT60 ANALYZER and DTE MODULE

Site Specifications

Specifications for the Reference and Offset Test

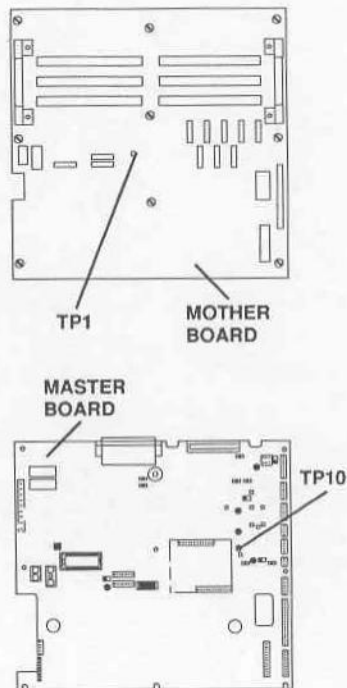
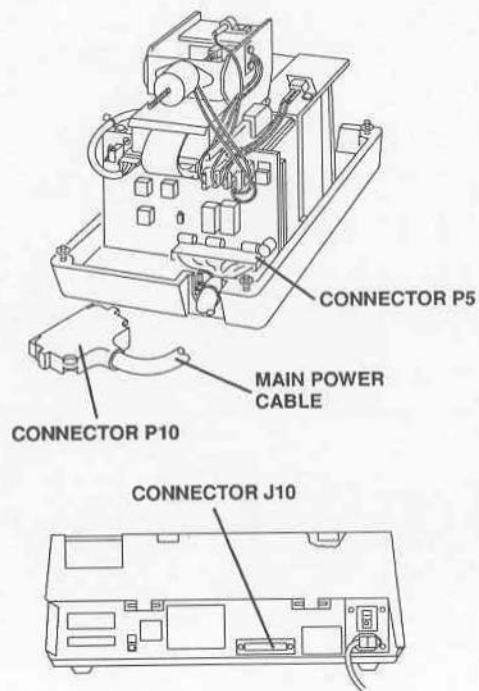
The 3 "REF" values should be within the range of -1500 to -1700 A/D units, and within 6 A/D units of each other.

The 3 "OFST" values should be within the range of -50 to +50 A/D units, and within 6 A/D units of each other.

Specifications for the Ground Path Checkout

The resistance should be $< 1 \Omega$, measured between TP1 on the INTERFACE BOARD and the following points:

- CONNECTOR P5 on the MAIN POWER CABLE
- CONNECTOR P10, PIN 50, on the MAIN POWER CABLE
- CONNECTOR J10, PIN 50, on the DT60 ANALYZER
- TP1 on the MOTHER BOARD, in Multi-Board configuration, or TP10 on the MASTER BOARD, in Single-Board configuration.



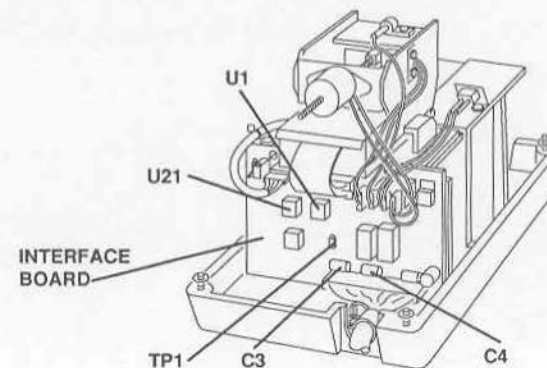
E904_0074DCA
E004_0074DC

Specifications for the Voltage Checkout Procedure

Voltage Measurement:	+	-	Specifications: V dc
+5 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U1, PIN 8	INTERFACE BOARD, TP1	+4.80 to +5.20
+15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C3, + LEG	INTERFACE BOARD, TP1	+14.5 to +15.5
-15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C4, - LEG	INTERFACE BOARD, TP1	-14.5 to -15.5
+12 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U21, PIN 8	INTERFACE BOARD, TP1	+11.85 to +12.15

NOTE

A Type 1 INTERFACE BOARD is indicated in the figure. The components are located in different positions on the Type 2 INTERFACE BOARD. If necessary, see the Parts and Removals section for the DTE MODULE.



E004_0072BCA
E004_0072BC

To Check for Correct Operation:

To determine if the ELECTROMETER and the circuits leading to it operate correctly, do the Reference and Offset Tests. The results must be successful. If the error code was intermittent, do the test enough times to check for an intermittent error. If any slides were being processed when the error code occurred, process the slide again. The error code should not occur again.

Electrical Malfunctions

Possible Causes	Recommended Actions
The internal power in, or to the ELECTROMETER has a malfunction.	Do the Reference and Offset Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. IMPORTANT If the error code occurs intermittently, repeat the Reference and Offset Test enough times to detect the malfunction.
The continuity of the ground path is not correct from the ELECTROMETER ASSEMBLY through the DT60 ANALYZER to the wall.	Check the ground path for the DTE MODULE. See the diagrams for the DTE MODULE, and use the specifications for the ground path checkout included in this diagnostic. Make any necessary repairs in the ground path. NOTE If the DT60 ANALYZER does not have an ADAPTER BOX installed, the GROUND SHIELD on the MAIN POWER CABLE for the DTE MODULE might not have a completed ground path. No action is necessary.
<div style="text-align: center; border: 1px dashed black; padding: 5px; margin: 10px auto; width: 100px;">CAUTION</div> <p>Correct earth ground is important to the stable operation of the ELECTROMETER ASSEMBLY.</p>	
The earth ground at the customer site is not correct.	If the earth ground at the customer site is not correct, speak to the customer about the recommended site specifications. The customer is expected to provide site conditions that are within the operating specifications for the equipment. See the Site Specifications, section 12 in this service manual.
The ELECTROMETER ASSEMBLY has a malfunction.	<ul style="list-style-type: none"> - Do the Voltage Checkout for the DTE MODULE. See the specifications included in this diagnostic. - If the voltage is within the specifications, install a new ELECTROMETER ASSEMBLY.

Electrical Malfunctions — Continued

Possible Causes	Recommended Actions
One of the following parts has a malfunction: INTERFACE BOARD MAIN POWER CABLE that connects the DTE MODULE to the DT60 ANALYZER For Error Codes E16 and E17 only: I/O BOARD MOTHER BOARD, in Multi-Board configuration or MASTER BOARD, in Single-Board configuration	If the voltage is not within the specifications, use the Diagrams, sections 6 and 7 in this service manual, to diagnose the malfunction. Repair the malfunction, or install a replacement part as necessary.

Error Codes E13 and E19 — "RESULTS INVALID"

DTE MODULE

Description

When any potentiometric slide is processed, the ELECTROMETER, through the CONTACTS, makes 3 consecutive readings of the slide. The 3 readings occur within milliseconds of each other. The A/D CONVERTER in the ELECTROMETER changes the data for each reading from mV to A/D units. The computer in the DT60 ANALYZER receives the A/D value.

Error Code E13

To check that the electronics in the ELECTROMETER are stable, the A/D results for the 3 readings are compared. If the 3 readings are not within 30 A/D units of each other, Error Code E13 is indicated on the printout and the test results are not displayed. The slide must be processed again. This error code detects rapid variations in the voltage readings and the related electronics and error codes in interface between the slide and the ELECTROMETER CONTACTS.

Error Code E19

The computer checks that the 3 consecutive readings are within the ranges given in the software limits. If the value for any of the 3 sample readings is not within -1700 to +1700 A/D units of each other, Error Code E19 is indicated on the printout and the test results are not displayed. The slide must be processed again.

Special Tools and Materials:

PUSH-PULL SCALE TL-1079
FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
MAGNIFIER TL-1442
3 new or used potentiometric slides
1 new potentiometric slide
Kodak Ektachem DT ELECTROLYTE REFERENCE FLUID

Possible Replacement Parts, DTE MODULE:

ELECTROMETER BOX ASSEMBLY, Type 2, 351800
INTERFACE CIRCUIT BOARD ASSEMBLY, Type 1, 617151
INTERFACE CIRCUIT BOARD ASSEMBLY, Type 2, 351554
MAIN POWER CABLE 617159
RIGHT-HAND SPRING 618265
LEFT-HAND SPRING 618266
SLIDE-LOADING SPRING 618251

Possible Replacement Parts, DT60 ANALYZER:

MOTHER BOARD ASSEMBLY 352495, for Multi-Board Configuration
MASTER BOARD ASSEMBLY 352655, for Single-Board Configuration

Additional Information

Adjustments and Special Procedures — DTE MODULE
Diagrams — DT60 ANALYZER and DTE MODULE
Parts and Removals — DT60 ANALYZER and DTE MODULE
Site Specifications

Specifications for the Reference and Offset Test

The 3 "REF" values should be within the range of -1500 to -1700 A/D units, and within 6 A/D units of each other.

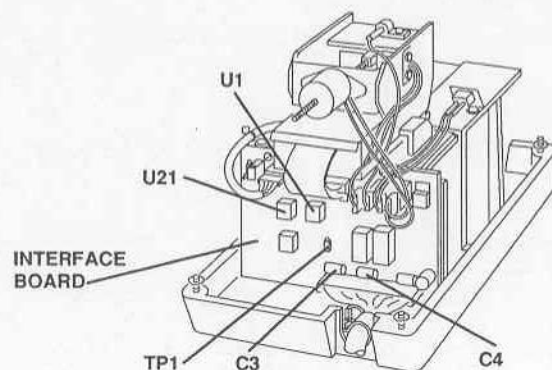
The 3 "OFST" values should be within the range of -50 to +50 A/D units, and within 6 A/D units of each other.

Specifications for the Voltage Checkout Procedure

Voltage Measurement:	+	—	Specifications: V dc
+5 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U1, PIN 8	INTERFACE BOARD, TP1	+4.80 to +5.20
+15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C3, + LEG	INTERFACE BOARD, TP1	+14.5 to +15.5
-15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C4, - LEG	INTERFACE BOARD, TP1	-14.5 to -15.5
+12 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U21, PIN 8	INTERFACE BOARD, TP1	+11.85 to +12.15

NOTE

A Type 1 INTERFACE BOARD is indicated in the figure. The components are located in different positions on the Type 2 INTERFACE BOARD. If necessary, see the Parts and Removals section for the DTE MODULE.



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E004_00728C

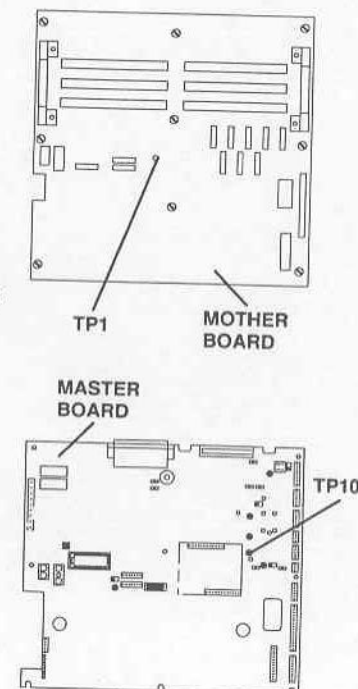
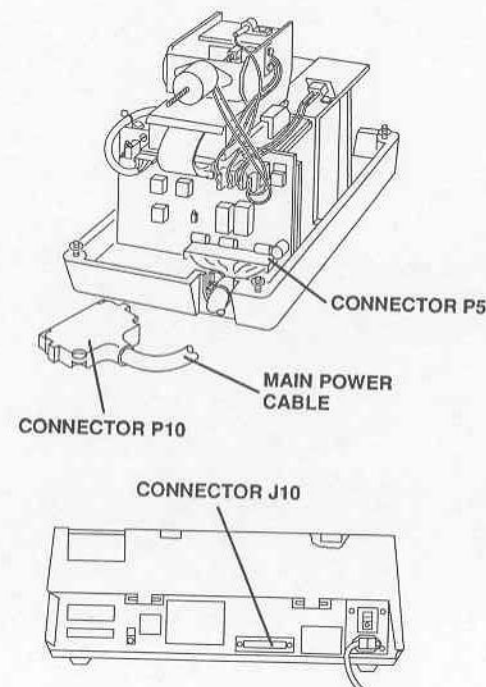
Specifications for the Bias Current Test

- "PASS" is indicated on the printout for Option 43. Wait 10 minutes.
- The "OFST" value on the printout for the first Option 44 is 1.2 or less.
- The "OFST" values on the 2 additional Option 44 printouts are within 0.5 of the first value.

Specifications for the Ground Path Checkout

The resistance should be $< 1 \Omega$, measured between TP1 on the INTERFACE BOARD and the following points:

- CONNECTOR P5 on the MAIN POWER CABLE
- CONNECTOR P10, PIN 50, on the MAIN POWER CABLE
- CONNECTOR J10, PIN 50, on the DT60 ANALYZER
- TP1 on the MOTHER BOARD, in Multi-Board configuration, or TP10 on the MASTER BOARD, in Single-Board configuration.



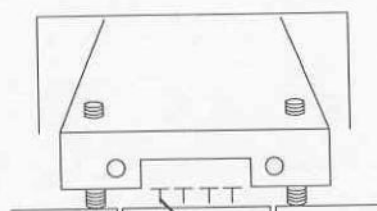
E004_0074DCA
E004_0074DC

Specifications for the Contact Verification Test

When KODAK EKTACHEM DT ELECTROLYTE REFERENCE FLUID is used in both DROP WELLS of a potentiometric slide and the slide is processed as a test, the "MV" value on the printout should be -5.0 mV to +5.0 mV.

Specifications for the Compression Adjustment — ELECTROMETER CONTACTS

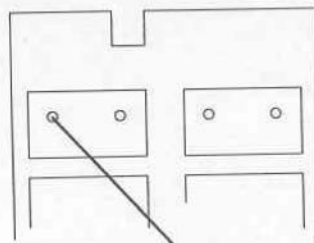
- When a slide is in the SPOTTING STATION, the ELECTROMETER CONTACTS should compress 0.75 to 1.0 mm (0.03 to 0.04 in.).



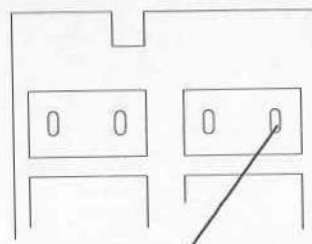
ELECTROMETER CONTACT

E004_0073BCA
E004_0073BC

- When the adjustment is correct, the 4 CONTACTS should puncture the ELECTRODES on the slide and make 4 small holes in the emulsion. With MAGNIFIER TL-1442, these holes should be visible when the slide is placed in front of a light source. The ELECTRODES should not be scratched adjacent to the punctured holes. See the illustrations for examples of CONTACT MARKS that are correct and not correct.



Correct CONTACT MARK



CONTACT MARK, not correct

E004_0058BCA
E004_0058BC

- The result of the Contact Verification Test should be within specifications.

Error Codes E13 and E19

To Check for Correct Operation:

Process the slides that were being processed when Error Code E13 or E19 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Electrical Malfunctions

Possible Causes	Recommended Actions
The internal power in, or to the ELECTROMETER has a malfunction.	Do the Reference and Offset Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. IMPORTANT If the error code occurs intermittently, repeat the Reference and Offset Test enough times to detect the malfunction.
The continuity of the ground path is not correct from the ELECTROMETER ASSEMBLY through the DT60 ANALYZER to the wall.	Check the ground path for the DTE MODULE. See the diagrams for the DTE MODULE, and use the specifications for the ground path checkout included in this diagnostic. Make any necessary repairs in the ground path. NOTE If the DT60 ANALYZER does not have an ADAPTER BOX installed, the GROUND SHIELD on the MAIN POWER CABLE for the DTE MODULE might not have a completed ground path. No action is necessary.
<div style="text-align: center; border: 1px dashed black; padding: 5px; margin: 10px 0;">CAUTION</div> <p>Correct earth ground is important to the stable operation of the ELECTROMETER ASSEMBLY.</p>	
The earth ground at the customer site is not correct.	If the earth ground at the customer site is not correct, speak to the customer about the recommended site specifications. The customer is expected to provide site conditions that are within the operating specifications for the equipment. See the Site Specifications, section 12 in this service manual.
The ELECTROMETER ASSEMBLY has a malfunction.	<ul style="list-style-type: none"> - Do the Voltage Checkout for the DTE MODULE. See the specifications included in this diagnostic. - If the voltage is within the specifications, install a new ELECTROMETER ASSEMBLY.

Error Codes E13 and E19

To Check for Correct Operation:

Process the slides that were being processed when Error Code E13 or E19 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

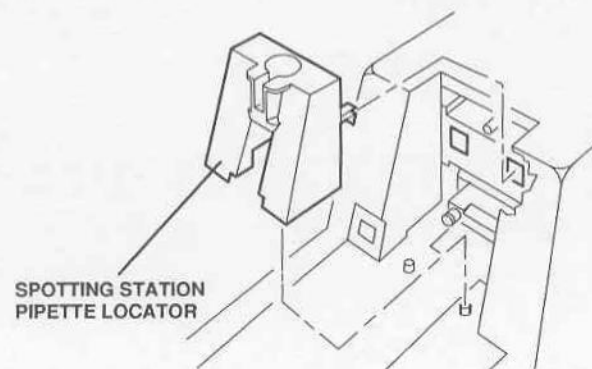
Electrical Malfunctions — Continued

Possible Causes	Recommended Actions
<p>One of the following parts has a malfunction:</p> <p>INTERFACE BOARD</p> <p>MAIN POWER CABLE that connects the DTE MODULE to the DT60 ANALYZER</p> <p>For Error Codes E16 and E17 only:</p> <p>I/O BOARD</p> <p>MOTHER BOARD, in Multi-Board configuration or</p> <p>MASTER BOARD, in Single-Board configuration</p>	<p>If the voltage is not within the specifications, use the Diagrams, sections 6 and 7 in this service manual, to diagnose the malfunction. Repair the malfunction, or install a replacement part as necessary.</p>

Error Codes E13 and E19

Errors in Interface between the Slide and the CONTACTS

Possible Causes	Recommended Actions
The SPOTTING STATION PIPETTE LOCATOR is not seated correctly.	<p>Ask the operator to check the position of the SPOTTING STATION PIPETTE LOCATOR and, if necessary, install and seat it correctly. See the figure on the bottom of this page.</p> <p>Ask the operator to process potentiometric slides and check for Error Code E13.</p>
The ELECTROMETER CONTACTS do not touch the slide with the correct compression.	<p>Do the Contact Verification Test. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.</p> <p>NOTE</p> <p>If the test is successful, advance to the "Metering Errors" section of this table.</p>
The ELECTROMETER CONTACTS do not make the correct CONTACT MARKS on the slides.	<p>Check the CONTACT MARKS on the potentiometric slides. See "To Check:" in the adjustment procedure, "ELECTROMETER CONTACTS — Compression", Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.</p>

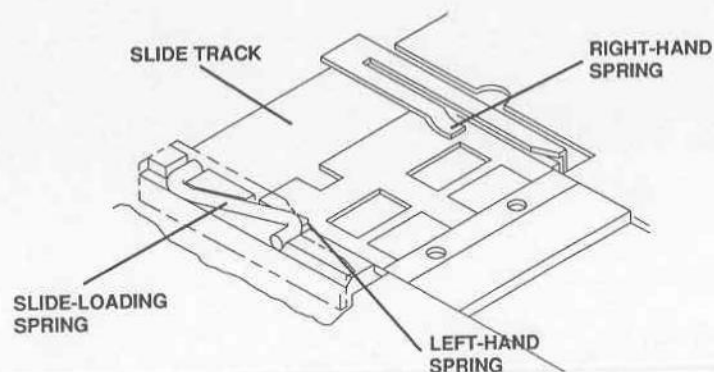


E004_0030BCA
E004_0030BC

Error Codes E13 and E19 - Continued

Errors in Interface between the Slide and the CONTACTS — Continued

Possible Causes	Recommended Actions
<p>The SURFACE PLATE is not installed correctly.</p> <p>A damaged LEFT-HAND SPRING, RIGHT-HAND SPRING, or SLIDE-LOADING SPRING prevents the slide from being placed and held in the correct position under the ELECTROMETER CONTACTS.</p>	<p>Check that the SURFACE PLATE is installed correctly and the SCREWS are tightened, but not overtightened.</p> <ul style="list-style-type: none"> - Use PUSH-PULL SCALE TL-1079 and check the slide insertion force: • Remove the SPOTTING STATION PIPETTE LOCATOR and the old slide remaining in the SPOTTING STATION. • Place a new slide on the SLIDE TRACK and push the SLIDE ADVANCE LEVER with the PUSH-PULL SCALE. • Check that the force used to move the slide into the SPOTTING STATION is 2 to 12 oz., the LEFT-HAND SPRING and the RIGHT-HAND SPRING are lifted, and the SLIDE-LOADING SPRING presses against the right side of the SLIDE TRACK when the slide is moved into the SPOTTING STATION. <p>See the figure at the bottom of this page.</p> <ul style="list-style-type: none"> • Install a new SPRING if necessary.
<p>The compression of the ELECTROMETER CONTACTS is not adjusted correctly, or the ELECTROMETER CONTACTS have a malfunction.</p>	<ul style="list-style-type: none"> - If the ELECTROMETER ASSEMBLY has 2 ADJUSTMENT SETSCREWS, do the compression adjustment for the ELECTROMETER CONTACTS. - If the ELECTROMETER ASSEMBLY has no ADJUSTMENT SETSCREWS, or if the CONTACTS are damaged, install a new ELECTROMETER ASSEMBLY.



Error Codes E13 and E19 - Continued

To Check for Correct Operation:

Process the slides that were being processed when Error Code E13 or E19 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

IMPORTANT

In version 11.0 software, the software checks for a "no drop" or small drop condition when a slide is processed. If a metering error occurs in a version 11.0 ANALYZER, Error Code E14 is displayed. In versions 9.0 and 10.7 ANALYZERS, a metering error is detected only if the sample readings are not within the expected ranges.

Metering Errors — Versions 9.0 and 10.7 Software only

Possible Causes	Recommended Actions
<p>The Kodak Ektachem DTE PIPETTE has a malfunction.</p>	<p>Use the DTE PIPETTE to aspirate sample and reference fluids. Remove the PIPETTE from the PIPETTE LOCATOR and check for the following conditions:</p> <ul style="list-style-type: none"> - The TIPS are seated correctly. - The PIPETTE has no leakage. - The TIPS hold the same quantities of fluid. - No fluid was aspirated into the PROBOSCIS. <p>For any other malfunction of the DTE PIPETTE, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.</p>

Electrical Malfunctions with High Impedance Slides

Possible Causes	Recommended Actions
<p>The ELECTROMETER cannot make accurate readings of potentiometric slides that have high impedance, as K+.</p>	<ul style="list-style-type: none"> - Do the Bias Current Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. <p>NOTE</p> <p>The Reference and Offset Test and the Contact Verification Test might be successful, without indicating a malfunction of the ELECTROMETER ASSEMBLY. The Bias Current Test provides an additional checkout.</p> <ul style="list-style-type: none"> - If the Bias Current Test is not successful, install a new ELECTROMETER ASSEMBLY.

Error Codes E13 and E19 - Continued

To Check for Correct Operation:

Process the slides that were being processed when Error Code E13 or E19 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Errors Not Caused by Equipment Malfunction

Possible Causes	Recommended Actions
The operator did not follow the correct procedures: <ul style="list-style-type: none">- Storing the fluids or the slides- Preparing the fluids- Using the DTE PIPETTE	<ul style="list-style-type: none">- If possible, observe the operator doing the procedures to process the potentiometric tests. Provide help and information if necessary.- If you cannot determine a cause for the error code, obtain help from the Customer Support Center in Rochester or from local Marketing personnel. The telephone number in Rochester is 800/521-0098.

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Error Code E14 — "RESULTS INVALID"

DTE MODULE

IMPORTANT

Error Code E14 occurs under 2 different conditions and has 2 different diagnostics. In all 3 versions of software, Error Code E14 can be displayed after Option 43 is executed, when the DT60 ANALYZER is operating in the "Service" mode.

If Error Code E14 follows an Option 43, see the diagnostic for Error Codes E15, E16, and E17. Do not use "E14" for technical feedback to SCAN.

If Error Code E14 occurs during slide processing, use this diagnostic. Use "E14" for technical feedback to SCAN.

Description

Error Code E14, during Slide Processing In Version 11.0 Software only:

In version 11.0 software only, when the DT60 ANALYZER is in the "Predict" mode for processing slides, the DTE MODULE is monitored for drops on a potentiometric slide after the PIPETTE BUTTON on the DTE PIPETTE actuates the MAGNETIC SWITCH in the PIPETTE LOCATOR. The voltage of the slide reading is checked to determine if the value is $>$ or $< \frac{1}{2}$ the 81.8 mV reference voltage: 40.9 mV.

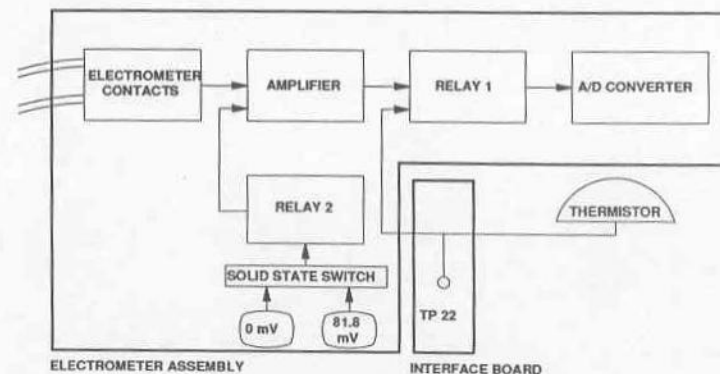
If the slide reading is > 40.9 mV, RELAY 2 in the ELECTROMETER connects the slide to a ground through internal circuits. The slide voltage is compared with the ground, or offset voltage value. The software expects a difference of more than 16 A/D units between the slide reading and the offset value.

If the slide reading is < 40.9 mV, RELAY 2 connects the full reference voltage of 81.8 mV through the slide. Another reading of the slide is made and the slide value is compared with the reference value. The software expects a difference of > 16 A/D units between the new slide reading and the reference value.

In either condition, if the difference is only 16 A/D units or less, a metering error or a contact error is indicated, and Error Code E14 is displayed on the printout. If the drop and the contact are correct, the connection of the ground or the reference voltage to the slide will cause a bias to the A/D CONVERTER when a comparison is made between the slide reading voltage and either the reference or the offset value.

Reference Voltage: To obtain the reference voltage, a RELAY in the ELECTROMETER is connected to an internal voltage signal of approximately 81.8 mV dc. See the figure on page 81. 3 reference readings are made within milliseconds of each other. The purpose of the reference readings is to obtain a given high value, similar to the purpose of the white reference reading for colorimetric tests.

Offset Voltage: To obtain the offset voltage, the RELAY is connected to an internal voltage signal of approximately 0 ± 1.25 mV dc. See the figure on page 81. 3 offset readings are made within milliseconds of each other. The purpose of the offset readings is to obtain a given low value, similar to the purpose of the black reference reading for colorimetric tests.



ELECTROMETER ASSEMBLY

INTERFACE BOARD

E003_0213BC

Block Diagram — ELECTROMETER

Special Tools and Materials:

PUSH-PULL SCALE TL-1079

FORS ADJUSTMENT BOARD TL-3340

MULTIMETER TL-3424

MAGNIFIER TL-1442

3 new or used potentiometric slides

1 new potentiometric slide

Kodak Ektachem DT ELECTROLYTE REFERENCE FLUID

Possible Replacement Parts, DTE MODULE:

ELECTROMETER BOX ASSEMBLY, Type 2, 351800

INTERFACE CIRCUIT BOARD ASSEMBLY, Type 1, 617151

INTERFACE CIRCUIT BOARD ASSEMBLY, Type 2, 351554

MAIN POWER CABLE 617159

RIGHT-HAND SPRING 618265

LEFT-HAND SPRING 618266

SLIDE-LOADING SPRING 618251

Possible Replacement Parts, DT60 ANALYZER:

MOTHER BOARD ASSEMBLY 352495, for Multi-Board Configuration

MASTER BOARD ASSEMBLY 352655, for Single-Board Configuration

Additional Information

Adjustments and Special Procedures — DTE MODULE

Diagrams — DT60 ANALYZER and DTE MODULE

Parts and Removals — DT60 ANALYZER and DTE MODULE

Site Specifications

Specifications for the Contact Verification Test

When KODAK EKTACHEM DT ELECTROLYTE REFERENCE FLUID is used in both DROP WELLS of a potentiometric slide and the slide is processed as a test, the "MV" value on the printout should be -5.0 mV to +5.0 mV.

Specifications for the Reference and Offset Test

The 3 "REF" values should be within the range of -1500 to -1700 A/D units, and within 6 A/D units of each other.

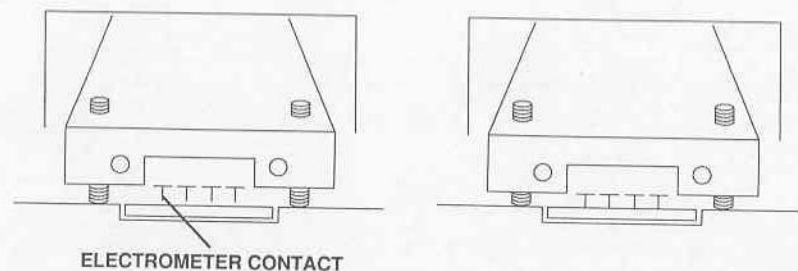
The 3 "OFST" values should be within the range of -50 to +50 A/D units, and within 6 A/D units of each other.

Specifications for the Bias Current Test

- "PASS" is indicated on the printout for Option 43. Wait 10 minutes.
- The "OFST" value on the printout for the first Option 44 is 1.2 or less.
The "OFST" values on the 2 additional Option 44 printouts are within 0.5 of the first value.

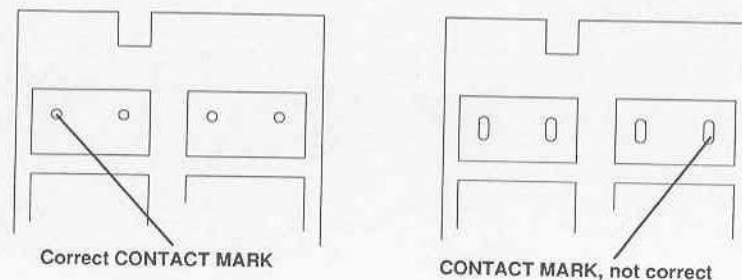
Specifications for the Compression Adjustment — ELECTROMETER CONTACTS

- When a slide is in the SPOTTING STATION, the ELECTROMETER CONTACTS should compress 0.75 to 1.0 mm (0.03 to 0.04 in.).



E004_0073BCA
E004_0073BC

- When the compression is adjusted correctly, the 4 CONTACTS should puncture the ELECTRODES on the slide and make 4 small holes in the emulsion. With MAGNIFIER TL-1442, these holes should be visible when the slide is placed in front of a light source. The ELECTRODES should not be scratched adjacent to the punctured holes. See the illustrations for examples of CONTACT MARKS that are correct and not correct.



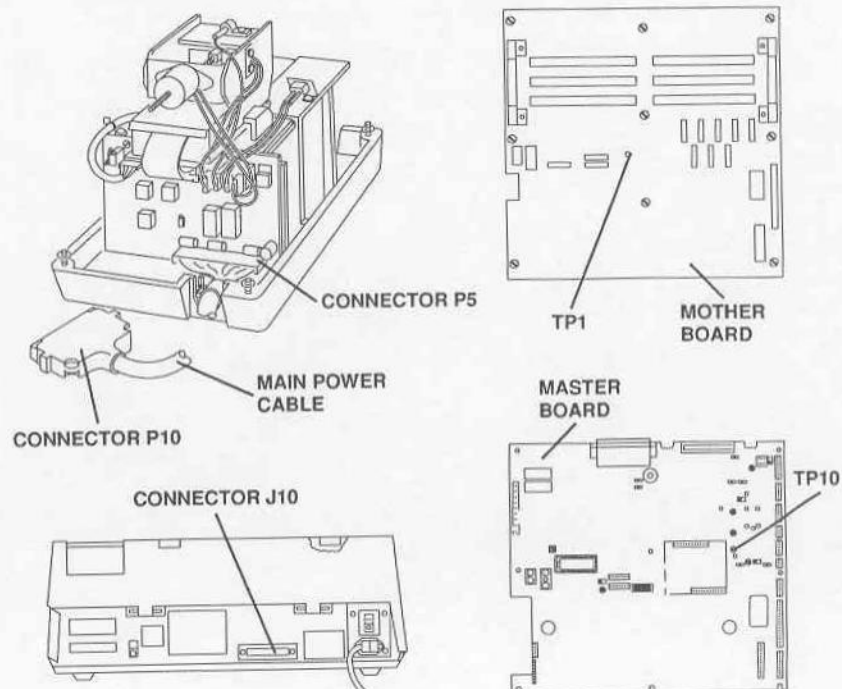
E004_0058BCA
E004_0058BC

- The result of the Contact Verification Test should be within specifications.

Specifications for the Ground Path Checkout

The resistance should be $< 1 \Omega$, measured between TP1 on the INTERFACE BOARD and the following points:

- CONNECTOR P5 on the MAIN POWER CABLE
- CONNECTOR P10, PIN 50, on the MAIN POWER CABLE
- CONNECTOR J10, PIN 50, on the DT60 ANALYZER
- TP1 on the MOTHER BOARD, in Multi-Board configuration, or TP10 on the MASTER BOARD, in Single-Board configuration.



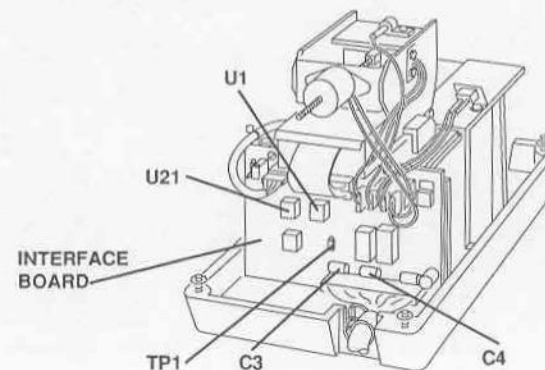
E004_0074DCA
E004_0074DC

Specifications for the Voltage Checkout Procedure

Voltage Measurement:	+	-	Specifications: V dc
+5 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U1, PIN 8	INTERFACE BOARD, TP1	+4.80 to +5.20
+15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C3, + LEG	INTERFACE BOARD, TP1	+14.5 to +15.5
-15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C4, - LEG	INTERFACE BOARD, TP1	-14.5 to -15.5
+12 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U21, PIN 8	INTERFACE BOARD, TP1	+11.85 to +12.15

NOTE

A Type 1 INTERFACE BOARD is indicated in the figure. The components are located in different positions on the Type 2 INTERFACE BOARD. If necessary, see the Parts and Removals section for the DTE MODULE.



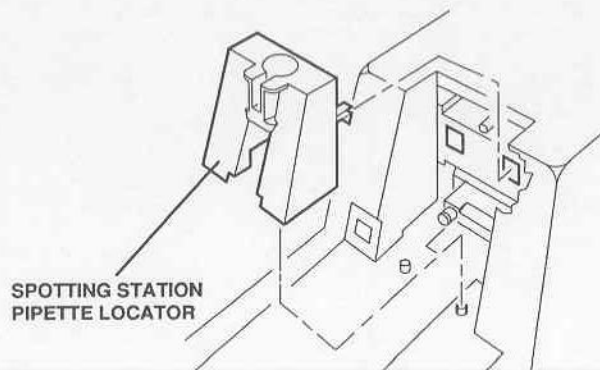
E004_0072BCA
E004_0072BC

To Check for Correct Operation:

Process the slides that were being processed when Error Code E14 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Errors in Interface between the Slide and the CONTACTS

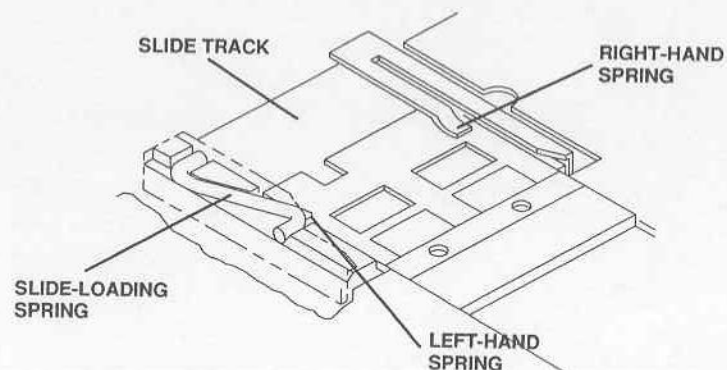
Possible Causes	Recommended Actions
The SPOTTING STATION PIPETTE LOCATOR is not seated correctly.	Ask the operator to check the position of the SPOTTING STATION PIPETTE LOCATOR and, if necessary, install and seat it correctly. See the figure on the bottom of this page. Ask the operator to process potentiometric slides and check for Error Code E13.
The ELECTROMETER CONTACTS do not touch the slide with the correct compression.	Do the Contact Verification Test. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. NOTE If the test is successful, advance to the "Metering Errors" section of this table.
The ELECTROMETER CONTACTS do not make the correct CONTACT MARKS on the slides.	Check the CONTACT MARKS on the potentiometric slides. See "To Check:" in the adjustment procedure, "ELECTROMETER CONTACTS — Compression", Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.



E004_0030BCA
E004_0030BC

Errors in Interface between the Slide and the CONTACTS — Continued

Possible Causes	Recommended Actions
The SURFACE PLATE is not installed correctly. A damaged LEFT-HAND SPRING, RIGHT-HAND SPRING, or SLIDE-LOADING SPRING prevents the slide from being placed and held in the correct position under the ELECTROMETER CONTACTS.	Check that the SURFACE PLATE is installed correctly and the SCREWS are tightened, but not overtightened. - Use PUSH-PULL SCALE TL-1079 and check the slide insertion force: <ul style="list-style-type: none"> Remove the SPOTTING STATION PIPETTE LOCATOR and the old slide remaining in the SPOTTING STATION. Place a new slide on the SLIDE TRACK and push the SLIDE ADVANCE LEVER with the PUSH-PULL SCALE. Check that the force used to move the slide into the SPOTTING STATION is 2 to 12 oz., the LEFT-HAND SPRING and the RIGHT-HAND SPRING are lifted, and the SLIDE-LOADING SPRING presses against the right side of the SLIDE TRACK when the slide is moved into the SPOTTING STATION. See the figure on the bottom of this page. Install a new SPRING if necessary.
The compression of the ELECTROMETER CONTACTS is not adjusted correctly, or the ELECTROMETER CONTACTS have a malfunction.	<ul style="list-style-type: none"> If the ELECTROMETER ASSEMBLY has 2 ADJUSTMENT SETSCREWS, do the compression adjustment for the ELECTROMETER CONTACTS. If the ELECTROMETER ASSEMBLY has no ADJUSTMENT SETSCREWS, or if the CONTACTS are damaged, install a new ELECTROMETER ASSEMBLY.



E004_0064BCA
E004_0064BC

To Check for Correct Operation:

Process the slides that were being processed when Error Code E14 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Electrical Malfunctions

Possible Causes	Recommended Actions
The internal power in, or to the ELECTROMETER has a malfunction.	Do the Reference and Offset Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. IMPORTANT If the error code occurs intermittently, repeat the Reference and Offset Test enough times to detect the malfunction.
The continuity of the ground path is not correct from the ELECTROMETER ASSEMBLY through the DT60 ANALYZER to the wall.	Check the ground path for the DTE MODULE. See the diagrams for the DTE MODULE, and use the specifications for the ground path checkout included in this diagnostic. Make any necessary repairs in the ground path. NOTE If the DT60 ANALYZER does not have an ADAPTER BOX installed, the GROUND SHIELD on the MAIN POWER CABLE for the DTE MODULE might not have a completed ground path. No action is necessary.
<div style="text-align: center;">CAUTION</div> <p>Correct earth ground is important to the stable operation of the ELECTROMETER ASSEMBLY.</p>	
The earth ground at the customer site is not correct.	If the earth ground at the customer site is not correct, speak to the customer about the recommended site specifications. The customer is expected to provide site conditions that are within the operating specifications for the equipment. See the Site Specifications, section 12 in this service manual.
The ELECTROMETER ASSEMBLY has a malfunction.	<ul style="list-style-type: none"> - Do the Voltage Checkout for the DTE MODULE. See the specifications included in this diagnostic. - If the voltage is within the specifications, install a new ELECTROMETER ASSEMBLY.

Electrical Malfunctions — Continued

Possible Causes	Recommended Actions
One of the following parts has a malfunction: INTERFACE BOARD MAIN POWER CABLE that connects the DTE MODULE to the DT60 ANALYZER For Error Codes E16 and E17 only: I/O BOARD MOTHER BOARD, in Multi-Board configuration or MASTER BOARD, in Single-Board configuration	If the voltage is not within the specifications, use the Diagrams, sections 6 and 7 in this service manual, to diagnose the malfunction. Repair the malfunction, or install a replacement part as necessary.

To Check for Correct Operation:

Process the slides that were being processed when Error Code E14 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Metering Errors

Possible Causes	Recommended Actions
The <i>Kodak Ektachem DTE PIPETTE</i> has a malfunction.	Use the <i>DTE PIPETTE</i> to aspirate sample and reference fluids. Remove the <i>PIPETTE</i> from the <i>PIPETTE LOCATOR</i> and check for the following conditions: <ul style="list-style-type: none"> - The <i>TIPS</i> are seated correctly. - The <i>PIPETTE</i> has no leakage. - The <i>TIPS</i> hold equal quantities of fluid. - No fluid was aspirated into the <i>PROBOSCIS</i>. For any other malfunction of the <i>DTE PIPETTE</i> , obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

Electrical Malfunctions with High Impedance Slides

Possible Causes	Recommended Actions
The <i>ELECTROMETER</i> cannot make accurate readings of potentiometric slides that have high impedance, as K+.	<ul style="list-style-type: none"> - Do the Bias Current Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the <i>DTE MODULE</i>, section 9 in this service manual. <p style="text-align: center;">NOTE</p> <p>The Reference and Offset Test and the Contact Verification Test might be successful, without indicating a malfunction of the <i>ELECTROMETER ASSEMBLY</i>. The Bias Current Test provides an additional checkout.</p> <ul style="list-style-type: none"> - If the Bias Current Test is not successful, install a new <i>ELECTROMETER ASSEMBLY</i>.

Errors Not Caused by Equipment Malfunction

Possible Causes	Recommended Actions
The operator did not follow the correct procedures: <ul style="list-style-type: none"> - Storing the fluids or the slides - Preparing the fluids - Using the <i>DTE PIPETTE</i> 	If possible, observe the operator doing the procedures to process the potentiometric tests. Provide help and information, if necessary. <p>If you cannot determine a cause for the error code, obtain help from the Customer Support Center in Rochester or from local Marketing personnel. The telephone number in Rochester is 800/521-0098.</p>

Error Code E18 — "RESULTS INVALID"

DTE MODULE

Description

When any potentiometric slide is processed, the ELECTROMETER makes 3 consecutive readings each of:

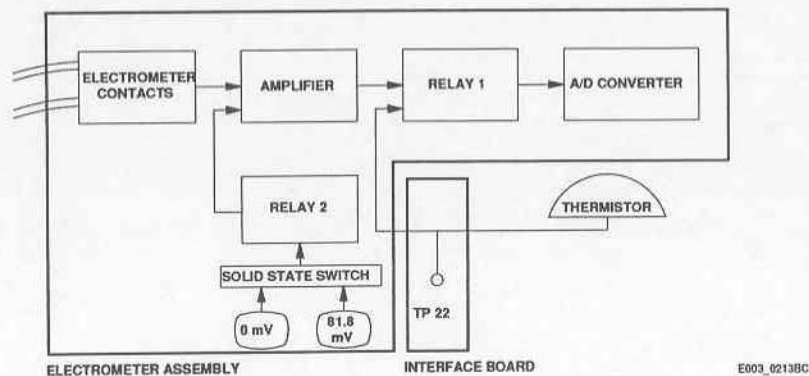
- an **Internal reference voltage**,
- an **Internal offset voltage**, and,
- an **external voltage** of the slide **through the CONTACTS**.

The 3 groups of readings occur within milliseconds of each other. Each reading is changed in the ELECTROMETER from a "mV" value to A/D units. Then the A/D value is sent to the computer in the DT60 ANALYZER.

If any offset value is not within -50 to +50 A/D units, Error Code E18 is displayed on the printout.

Reference Voltage: To obtain the reference voltage, a RELAY in the ELECTROMETER is connected to an internal voltage signal of approximately 81.8 mV dc. See the figure on the bottom of this page. 3 reference readings are made within milliseconds of each other. The purpose of the reference readings is to obtain a given high value, similar to the purpose of the white reference reading for colorimetric tests.

Offset Voltage: To obtain the offset voltage, the RELAY is connected to an internal voltage signal of approximately 0 ± 1.25 mV dc. See the figure on the bottom of this page. 3 offset readings are made within milliseconds of each other. The purpose of the offset readings is to obtain a given low value, similar to the purpose of the black reference reading for colorimetric tests.



Block Diagram — ELECTROMETER

Special Tools and Materials:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
3 new or used potentiometric slides

Possible Replacement Parts, DTE MODULE:

ELECTROMETER BOX ASSEMBLY, Type 2, 351800
INTERFACE CIRCUIT BOARD ASSEMBLY, Type 1, 617151
INTERFACE CIRCUIT BOARD ASSEMBLY, Type 2, 351554
MAIN POWER CABLE 617159

Possible Replacement Parts, DT60 ANALYZER:

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software in Multi-Board Configuration
I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 10.7 Software and above in Multi-Board Configuration
MOTHER BOARD ASSEMBLY 352495, for Multi-Board Configuration
MASTER BOARD ASSEMBLY 352655, for Single-Board Configuration

Additional Information

Adjustments and Special Procedures — DTE MODULE

Diagrams — DT60 ANALYZER and DTE MODULE

Parts and Removals — DT60 ANALYZER and DTE MODULE

Site Specifications

Specifications for the Reference and Offset Test

The 3 "REF" values should be within the range of -1500 to -1700 A/D units, and within 6 A/D units of each other.

The 3 "OFST" values should be within the range of -50 to +50 A/D units, and within 6 A/D units of each other.

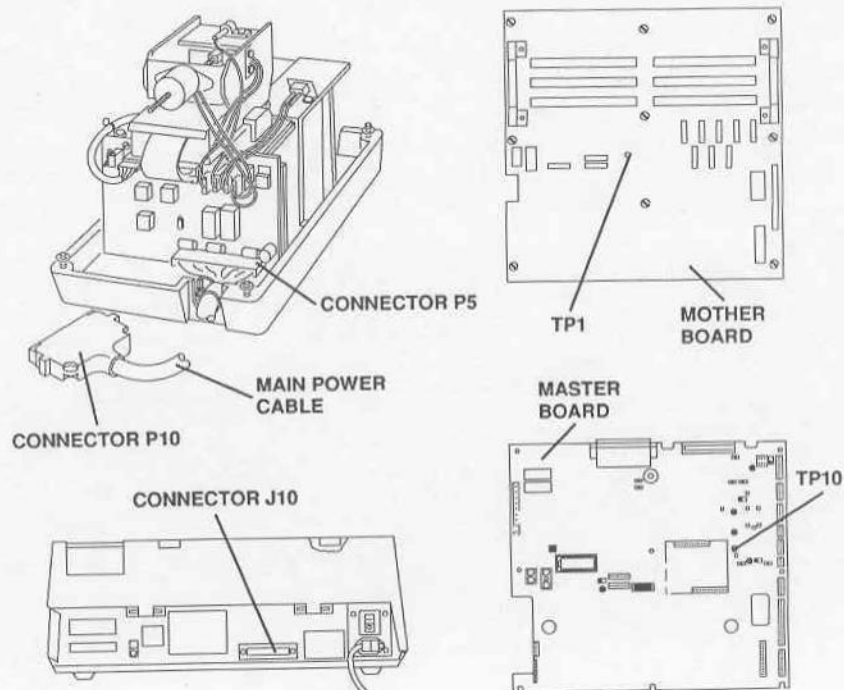
Specifications for the Bias Current Test

- "PASS" is indicated on the printout for Option 43. Wait 10 minutes.
- The "OFST" value on the printout for the first Option 44 is 1.2 or less.
The "OFST" values on the 2 additional Option 44 printouts are within 0.5 of the first value.

Specifications for the Ground Path Checkout

The resistance should be $< 1 \Omega$, measured between TP1 on the INTERFACE BOARD and the following points:

- CONNECTOR P5 on the MAIN POWER CABLE
- CONNECTOR P10, PIN 50, on the MAIN POWER CABLE
- CONNECTOR J10, PIN 50, on the DT60 ANALYZER
- TP1 on the MOTHER BOARD, in Multi-Board configuration, or TP10 on the MASTER BOARD, in Single-Board configuration.



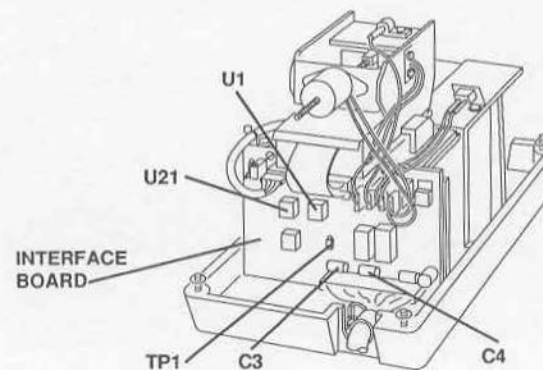
E004_0074DCA
E004_0074DC

Specifications for the Voltage Checkout Procedure

Voltage Measurement:	+	-	Specifications: V dc
+5 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U1, PIN 8	INTERFACE BOARD, TP1	+4.80 to +5.20
+15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C3, + LEG	INTERFACE BOARD, TP1	+14.5 to +15.5
-15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C4, - LEG	INTERFACE BOARD, TP1	-14.5 to -15.5
+12 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U21, PIN 8	INTERFACE BOARD, TP1	+11.85 to +12.15

NOTE

A Type 1 INTERFACE BOARD is indicated in the figure. The components are located in different positions on the Type 2 INTERFACE BOARD. If necessary, see the Parts and Removals section for the DTE MODULE.



E004_0072BCA
E004_0072BC

Error Code E18

To Check for Correct Operation:

Process the slides that were being processed when Error Code E18 occurred. The error code should not occur again. Check for an intermittent error code if necessary

Electrical Malfunctions

Possible Causes	Recommended Actions
The internal power in, or to the ELECTROMETER has a malfunction.	<p>Do the Reference and Offset Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.</p> <p>IMPORTANT</p> <ul style="list-style-type: none"> - If the Reference and Offset Test was successful, do the test 2 times again. - If the test is successful all 3 times, advance to the next item in this table. - If the Reference and Offset Test is not successful all 3 times, skip the following item and do the Voltage Checkout Procedure for the DTE MODULE.
The internal power to, or in the ELECTROMETER has a malfunction that is not detected by the Reference and Offset Test.	<p>Do the Bias Current Test. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.</p> <ul style="list-style-type: none"> - If the Bias Current Test is not successful, install a new ELECTROMETER ASSEMBLY. - If the Bias Current Test is successful, advance to the following item in the table.
The continuity of the ground path is not correct from the ELECTROMETER ASSEMBLY through the DT60 ANALYZER to the wall.	<p>Check the ground path for the DTE MODULE. See the diagrams for the DTE MODULE, and use the specifications for the ground path checkout included in this diagnostic. Make any necessary repairs in the ground path.</p> <p>NOTE</p> <p>If the DT60 ANALYZER does not have an ADAPTER BOX installed, the GROUND SHIELD on the MAIN POWER CABLE for the DTE MODULE might not have a completed ground path. No action is necessary.</p>

Error Code E18 - Continued

Electrical Malfunctions — Continued

Possible Causes	Recommended Actions
<p>CAUTION</p> <p>Correct earth ground is important to the stable operation of the ELECTROMETER ASSEMBLY.</p>	
The earth ground at the customer site is not correct.	If the earth ground at the customer site is not correct, speak to the customer about the recommended site specifications. The customer is expected to provide site conditions that are within the operating specifications for the equipment. See the Site Specifications, section 12 in this service manual.
The ELECTROMETER ASSEMBLY has a malfunction.	<ul style="list-style-type: none"> - Do the Voltage Checkout for the DTE MODULE. See the specifications included in this diagnostic. - If the voltage is within the specifications, install a new ELECTROMETER ASSEMBLY.
One of the following parts has a malfunction: INTERFACE BOARD MAIN POWER CABLE that connects the DTE MODULE to the DT60 ANALYZER For Error Codes E16 and E17 only: I/O BOARD MOTHER BOARD, in Multi-Board configuration or MASTER BOARD, in Single-Board configuration	If the voltage is not within the specifications, use the Diagrams, sections 6 and 7 in this service manual, to diagnose the malfunction. Repair the malfunction, or install a replacement part as necessary.

Error Code E20 — "RESULTS INVALID"

DTE MODULE

Description

When any potentiometric slide is processed, the ELECTROMETER makes 3 consecutive readings each of:

- an internal reference voltage,
- an internal offset voltage, and,
- an external voltage of the slide through the CONTACTS.

The 3 groups of readings occur within milliseconds of each other. Each reading is changed in the ELECTROMETER from a "mV" value to A/D units. Then the A/D value is sent to the computer in the DT60 ANALYZER.

If any offset value is not within -50 to +50 A/D units, Error Code E20 is displayed on the printout.

Special Tools and Materials:

PUSH-PULL SCALE TL-1079
FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424
MAGNIFIER TL-1442
3 new or used potentiometric slides
1 new potentiometric slide

Possible Replacement Parts, DTE MODULE:

LEFT-HAND SPRING 618266
RIGHT-HAND SPRING 618265
SLIDE-LOADING SPRING 618251
ELECTROMETER BOX ASSEMBLY, Type 2, 351800
INTERFACE CIRCUIT BOARD ASSEMBLY, Type 1, 617151
INTERFACE CIRCUIT BOARD ASSEMBLY, Type 2, 351554
MAIN POWER CABLE 617159

Possible Replacement Parts, DT60 ANALYZER:

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software in Multi-Board Configuration
I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 10.7 Software and above in Multi-Board Configuration
MOTHER BOARD ASSEMBLY 352495, for Multi-Board Configuration
MASTER BOARD ASSEMBLY 352655, for Single-Board Configuration

Additional Information

Adjustments and Special Procedures — DTE MODULE
Diagrams — DT60 ANALYZER and DTE MODULE
Parts and Removals — DT60 ANALYZER and DTE MODULE
Site Specifications

Specifications for the Contact Verification Test

When reference fluid is used in both DROP WELLS of a potentiometric slide and the slide is processed as a test, the "MV" value on the printout should be -5.0 mV to +5.0 mV.

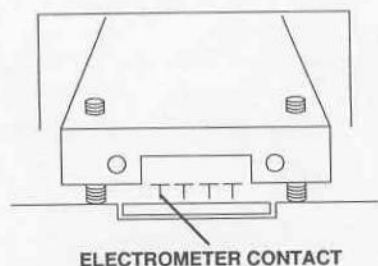
Specifications for the Reference and Offset Test

The 3 "REF" values should be within the range of -1500 to -1700 A/D units, and within 6 A/D units of each other.

The 3 "OFST" values should be within the range of -50 to +50 A/D units, and within 6 A/D units of each other.

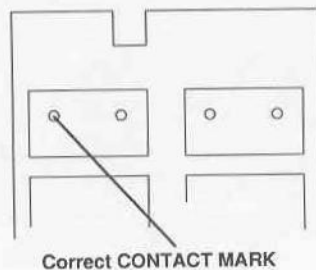
Specifications for the Compression Adjustment — ELECTROMETER CONTACTS

- When a slide is in the SPOTTING STATION, the ELECTROMETER CONTACTS should compress 0.75 to 1.0 mm (0.03 to 0.04 in.).

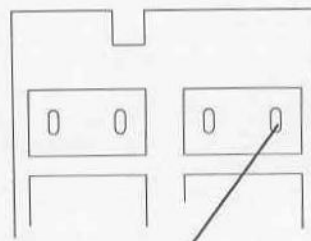


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E004_0073BC

- When the compression is adjusted correctly, the 4 CONTACTS should puncture the ELECTRODES on the slide and make 4 small holes in the emulsion. With MAGNIFIER TL-1442, these holes should be visible when the slide is placed in front of a light source. The ELECTRODES should not be scratched adjacent to the punctured holes. See the illustrations for examples of CONTACT MARKS that are correct and not correct.



Correct CONTACT MARK



CONTACT MARK, not correct

E004_0058BCA
E004_0058BC

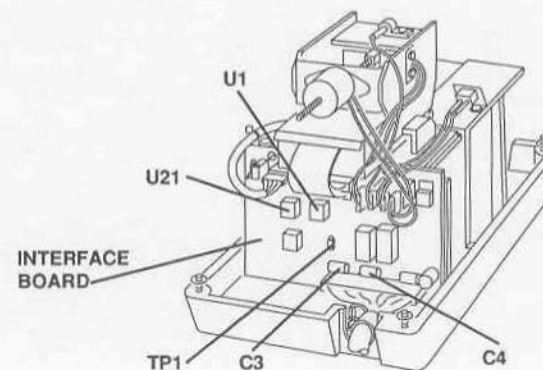
- The result of the Contact Verification Test should be within specifications.

Specifications for the Voltage Checkout Procedure

Voltage Measurement:	+	—	Specifications: V dc
+5 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U1, PIN 8	INTERFACE BOARD, TP1	+4.80 to +5.20
+15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C3, + LEG	INTERFACE BOARD, TP1	+14.5 to +15.5
-15 V dc circuit from INTERFACE BOARD to ELECTROMETER	INTERFACE BOARD, C4, - LEG	INTERFACE BOARD, TP1	-14.5 to -15.5
+12 V dc circuit from DT60 ANALYZER to INTERFACE BOARD	INTERFACE BOARD, U21, PIN 8	INTERFACE BOARD, TP1	+11.85 to +12.15

NOTE

A Type 1 INTERFACE BOARD is indicated in the figure. The components are located in different positions on the Type 2 INTERFACE BOARD. If necessary, see the Parts and Removals section for the DTE MODULE.



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E004_0072BC

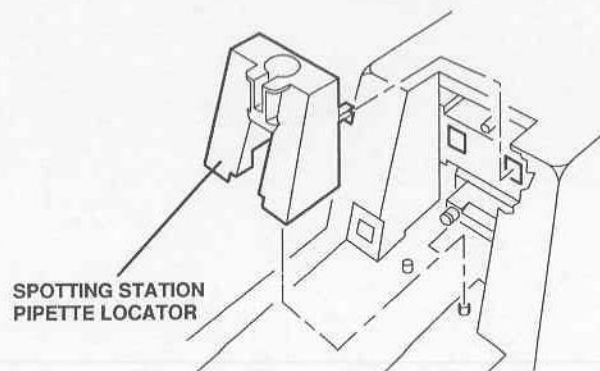
Error Code E20

To Check for Correct Operation:

Process the slides that were being processed when Error Code E20 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Errors in Interface between the Slide and the CONTACTS

Possible Causes	Recommended Actions
The SPOTTING STATION PIPETTE LOCATOR is not seated correctly.	Ask the operator to check the position of the SPOTTING STATION PIPETTE LOCATOR and, if necessary, install and seat it correctly. See the figure on the bottom of this page. Ask the operator to process potentiometric slides and check for Error Code E20.
The ELECTROMETER CONTACTS do not touch the slide with the correct compression.	Do the Contact Verification Test. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. NOTE If the test is successful, advance to the "Metering Errors" section of this table.
The ELECTROMETER CONTACTS do not make the correct CONTACT MARKS on the slides.	Check the CONTACT MARKS on the potentiometric slides. See "To Check:" in the adjustment procedure, "ELECTROMETER CONTACTS — Compression", Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.

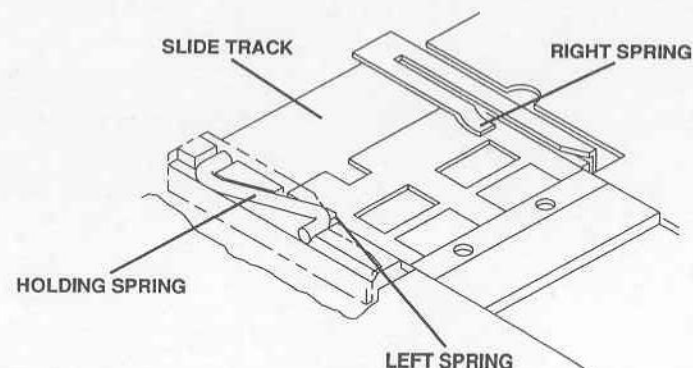


E004_0030BCA
E004_0030BC

Error Code E20 - Continued

Errors in Interface between the Slide and the CONTACTS — Continued

Possible Causes	Recommended Actions
The SURFACE PLATE is not installed correctly.	Check that the SURFACE PLATE is installed correctly and the SCREWS are tightened, but not overtightened.
A damaged LEFT SPRING, RIGHT SPRING, or HOLDING SPRING prevents the slide from being placed and held in the correct position under the ELECTROMETER CONTACTS.	<ul style="list-style-type: none"> - Use PUSH-PULL SCALE TL-1079 and check the slide insertion force: • Remove the SPOTTING STATION PIPETTE LOCATOR and the old slide remaining in the SPOTTING STATION. • Place a new slide on the SLIDE TRACK and push the SLIDE ADVANCE LEVER with the PUSH-PULL SCALE. • Check that the force used to move the slide into the SPOTTING STATION is 2 to 12 oz., the LEFT SPRING and the RIGHT SPRING are lifted, and the HOLDING SPRING presses against the right side of the SLIDE TRACK when the slide is moved into the SPOTTING STATION. See the figure at the bottom of this page. • Install a new SPRING if necessary.
The compression of the ELECTROMETER CONTACTS is not adjusted correctly, or the ELECTROMETER CONTACTS have a malfunction.	<ul style="list-style-type: none"> - If the ELECTROMETER ASSEMBLY has 2 ADJUSTMENT SETSCREWS, do the compression adjustment for the ELECTROMETER CONTACTS. - If the ELECTROMETER ASSEMBLY has no ADJUSTMENT SETSCREWS, or if the CONTACTS are damaged, install a new ELECTROMETER ASSEMBLY.



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E004_0064BC

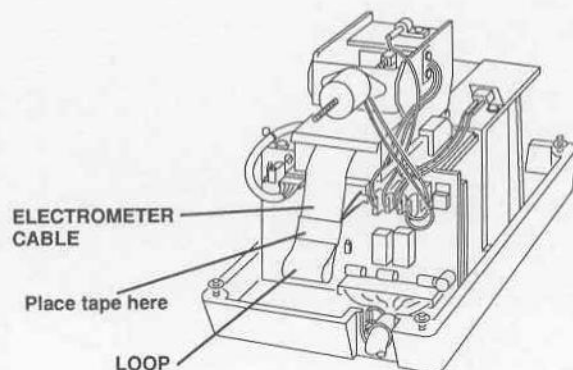
Error Code E20 - Continued

To Check for Correct Operation:

Process the slides that were being processed when Error Code E20 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Errors in Interface between the Slide and the CONTACTS — Continued

Possible Causes	Recommended Actions
The ELECTROMETER has erratic motion between the left side and the right side during the actuation of the LINEAR ACTUATOR. This motion causes variation in the CONTACT MARKS on the slides. Some older ELECTROMETERS have excessively long CABLES that cause or allow the erratic motion.	<p>To obtain the correct uniform motion of the ELECTROMETER, do the following steps to make the ELECTROMETER CABLE shorter:</p> <ul style="list-style-type: none"> - Make a LOOP in the CABLE. - Use 12.7 mm (0.50 in.) adhesive tape. Place the tape around the CABLE to hold the LOOP approximately 12.7 mm (0.50 in.) from the end. See the following illustration. - After the tape is attached, check that the ELECTROMETER has fully free motion, and that the FLAG can move into the HOME SENSOR. - Execute Options 40 and 41 and observe the HOME SENSOR LED.



E004_0031BCA
E004_0031BC

Error Code E20 - Continued

IMPORTANT

In Version 11.0 Software, the software checks for a "no drop" or small drop condition when a slide is processed. If a metering error occurs in a version 11.0 ANALYZER, Error Code E14 is displayed. In versions 9.0 and 10.7 ANALYZERS, a metering error is detected only if the sample readings are not within the expected ranges.

Metering Errors — Versions 9.0 and 10.7 Software only

Possible Causes	Recommended Actions
The Kodak Ektachem DTE PIPETTE has a malfunction.	<p>Use the DTE PIPETTE to aspirate sample and reference fluids. Remove the PIPETTE from the PIPETTE LOCATOR and check for the following conditions:</p> <ul style="list-style-type: none"> - The TIPS are seated correctly. - The PIPETTE has no leakage. - The TIPS hold equal quantities of fluid. - No fluid was aspirated into the PROBOSCIS. <p>For any other malfunction of the DTE PIPETTE, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.</p>

Errors in Storing or Preparing the Fluids

Possible Causes	Recommended Actions
An excessively high concentration of a fluid used in processing slides might cause an excessive difference in the measured electrical potential of the ELECTRODES on the slide. This condition could cause an Error Code E20.	<ul style="list-style-type: none"> - Check that the fluids were stored and prepared correctly. See the diagnostic, "Problems with Precision and Accuracy", in this section of the service manual. - If necessary, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

Error Code E20 - Continued

To Check for Correct Operation:

Process the slides that were being processed when Error Code E20 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Electrical Malfunctions

Possible Causes	Recommended Actions
The internal power in, or to the ELECTROMETER has a malfunction.	Do the Reference and Offset Test. If you are not at the customer site, the operator could do this procedure. Read the steps to the operator and ask for information about the results. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the <i>DTE</i> MODULE, section 9 in this service manual. IMPORTANT If the error code occurs intermittently, repeat the Reference and Offset Test enough times to detect the malfunction.
The ELECTROMETER ASSEMBLY has a malfunction.	<ul style="list-style-type: none"> - Do the Voltage Checkout for the <i>DTE</i> MODULE. See the specifications included in this diagnostic. - If the voltage is within the specifications, install a new ELECTROMETER ASSEMBLY.
<p>One of the following parts has a malfunction:</p> <p>INTERFACE BOARD</p> <p>MAIN POWER CABLE that connects the <i>DTE</i> MODULE to the <i>DT60</i> ANALYZER</p> <p>For Error Codes E16 and E17 only:</p> <p>I/O BOARD</p> <p>MOTHER BOARD, in Multi-Board configuration or</p> <p>MASTER BOARD, in Single-Board configuration</p>	If the voltage is not within the specifications, use the Diagrams, sections 6 and 7 in this service manual, to diagnose the malfunction. Repair the malfunction, or install a replacement part as necessary.

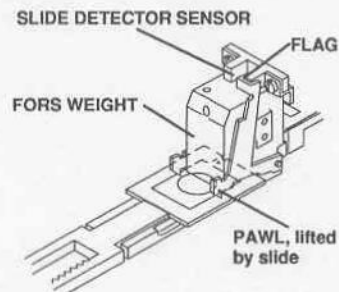
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Error Codes F12, F13, and F14 — "TRANSFER MALFUNCTION"

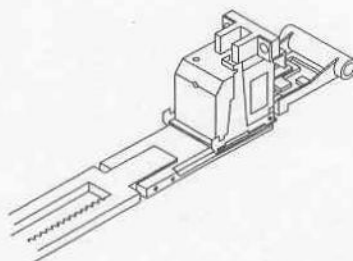
DT60 ANALYZER

Description

The computer in the DT60 ANALYZER monitors the motion of the slide from the INCUBATOR to the READ STATION. During normal operation, the slide lifts the PAWLS on the FORS WEIGHT when the slide enters the READ STATION. When the right PAWL is up, the FLAG enters the SLIDE DETECTOR SENSOR. When the FLAG is in the SLIDE DETECTOR SENSOR, the SENSOR sends a logic Hi signal to the computer. If no slide enters the READ STATION, the PAWL falls into the RECESS of the LOWER RACK. The FLAG does not enter the SLIDE DETECTOR SENSOR, and the SENSOR sends a logic Lo signal.



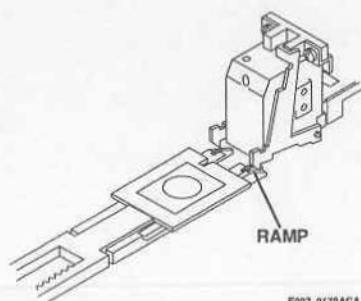
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E003_0193AC



E003_0182AC

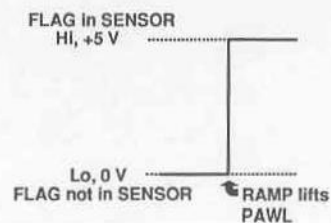
Logic Hi Signal

In the following example, the LOWER RACK moves forward to push the slide from the INCUBATOR to the READ STATION. The PAWL first is lifted by the RAMP on the LOWER RACK. A +5 V logic Hi signal is executed.



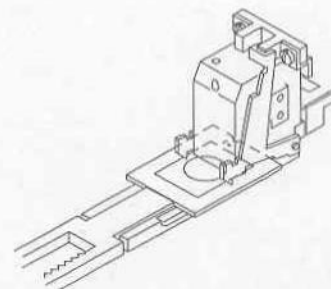
E003_0179ACA
E003_0179AC

Logic Lo Signal

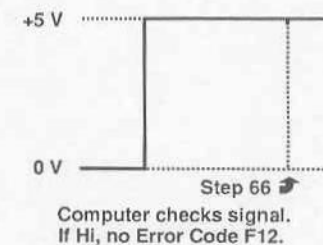


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E003_0214AC

As the slide enters the READ STATION, the PAWL continues to be lifted. The logic Hi signal remains displayed. At step +66, the computer does a checkout for the logic Hi signal. If the +5 V logic Hi signal is detected, no error code occurs.

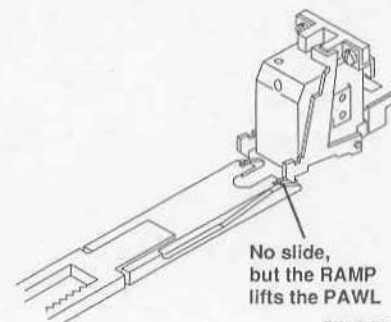


E003_0153AC

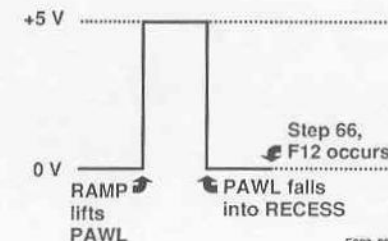


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E003_0215AC

If a Lo signal is detected at step 66, Error Code F12 is displayed. A slide jam in the INCUBATOR could cause this condition. Note that with or without a slide, the RAMP does provide a temporary Hi signal when it lifts the PAWL, but the expected Hi signal will be detected at step 66 only if a slide is in position on the LOWER RACK. Without a slide, the PAWL falls into the RECESS and the FLAG is moved from the SENSOR before step 66.

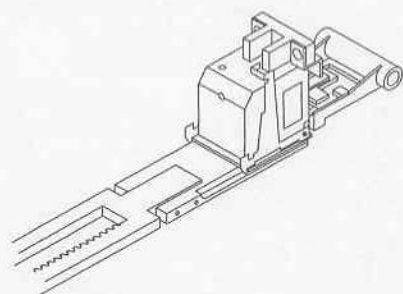


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E003_0152AC

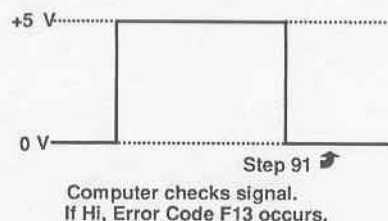


E003_0216ACA
E003_0216AC

When the slide is staged in the READ STATION, the PAWL falls from the edge of the slide into the RECESS on the LOWER RACK. The SLIDE DETECTOR SENSOR sends a Lo signal. This normally occurs at step 86. At step 91, the software checks for the Lo signal. If the software checks for the Lo signal. If a logic Hi signal is received, Error Code F13 is displayed. This condition is usually caused if a slide jam prevents the slide from staging fully.

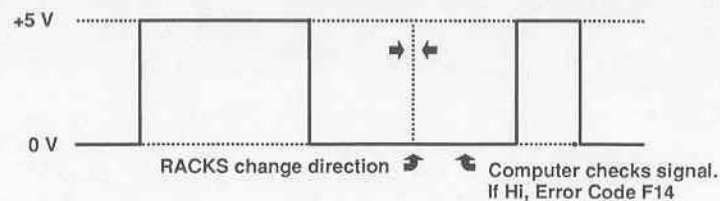


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E003_0217ACA
E005_0217AC

At approximately step 92 to 94, the MOTOR AND PINION ASSEMBLY reverses the direction and the LOWER RACK is moved from the READ STATION toward the Home Position. At approximately step 75, when the LOWER RACK is between the READ STATION and the Home Position, the computer checks the signal from the SLIDE PRESENT SENSOR. The slide should be held against the PAWLS and not be moved backward with the LOWER RACK. The software expects a Lo signal at step 75. If a Hi signal is detected, Error Code F14 is displayed. Note that the RAMP lifts the PAWLS for a short time when the LOWER RACK is moving backward, but the computer checks for a Hi signal before the RAMP moves under the RIGHT PAWL.



E003_0218BCA
E003_0218BC

The main purpose of error codes F12, F13, and F14 is to indicate slide jams. Malfunctions in the SLIDE DETECTOR SENSOR or obstructions to the free motion of the PAWLS or the FORS WEIGHT ASSEMBLY might also cause conditions that will execute these error codes.

Special Tools and Materials:

FEELER GAUGES TL-1384 or TL-2372
WHITE REFERENCE SLIDE TL-3344 with the labelled box
BLACK REFERENCE SLIDE TL-3345 with the labelled box
CALIBRATION LABEL, Publication No. XP3100-28

Possible Replacement Parts:

For Both Configurations:

FORS WEIGHT ASSEMBLY 352696
LOWER RACK ASSEMBLY 352434, or
LOWER RACK ASSEMBLY 352543
SURFACE PLATE 613825
SCREWS 179061 and LOCK WASHERS 188828, or Self-Tapping SCREWS 486527
HOME/SLIDE SENSOR 350247 (SLIDE DETECTOR SENSOR)

For Multi-Board Configuration:

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software
I/O CIRCUIT BOARD ASSEMBLY 352520, for Version 10.7 Software and above
DRIVER CIRCUIT BOARD ASSEMBLY 352387
MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

Additional Information:

Normal Operation — DT60 ANALYZER

Slide Transport System

Adjustments and Special Procedures — DT60 ANALYZER

HOME SENSOR and LOWER RACK

UPPER RACK

LOWER ARM

UPPER ARM - Height

D_R Procedure

Correction Factors Procedure

Parts and Removals — DT60 ANALYZER

SLIDE DETECTOR SENSOR

LOWER RACK

FORS WEIGHT ASSEMBLY

PIVOT PIN

Specifications for the Adjustment of the HOME SENSOR and LOWER RACK:

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at **step +86**, and
- move down off the TRAILING EDGE of the slide at **step +87, +88, or +89**.

Specifications for the Adjustment of the UPPER RACK:

Execute Option 68 for **-59 steps**, and measure 0.152 to 1.54 mm (0.005 to 0.023 in.) between the PUSHER FINGER and the INCUBATOR.

Specifications for the Adjustment of the LOWER ARM:

- When the UPPER RACK is in the home-position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance, and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

Specifications for the Adjustment of the Height of the UPPER ARM:

When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

NOTE

For a Type 1 PRESSURE PAD, the step count is **+20**.

For a Type 2 PRESSURE PAD, the step count is **+70**.

With the RACKS in the home-position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

Specifications for the Alignment of the SLIDE DETECTOR SENSOR:

The specification cannot be measured without doing the adjustment procedure. With a slide under the PAWLS, rotate the SETSCREW until the "SLIDE" LED or the DS4 LED first energizes. Then rotate the SETSCREW an additional 1.5 rotations counterclockwise.

Error Code F12

To Check for Correct Operation:

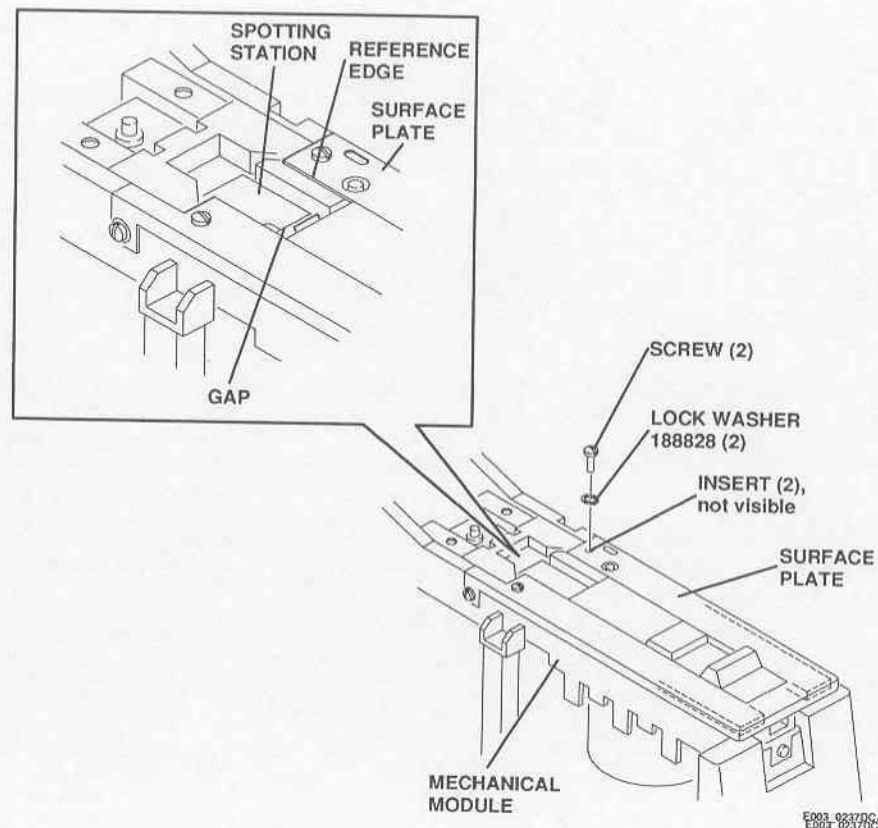
To check that the malfunction is repaired, process a slide in the *DT60* ANALYZER. If Error Code F12 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were cancelled when the PIPETTE LOCATOR COVER was lifted.

Possible Causes	Recommended Actions
A slide jam prevents the slide from reaching the READ STATION.	Operator action: Lift the PIPETTE LOCATOR and clear any slide jam. Process the test again. If the error code occurs again, the customer should call for service.
<ul style="list-style-type: none">- A bind in the PRESSURE PAD causes a slide jam.- The UPPER ARM is adjusted to lift the PRESSURE PAD too high above the slide. The STEM of the PRESSURE PAD binds with the PRESSURE PAD in the lifted position.	Check that the following adjustments allow the correct motion of the PRESSURE PAD: <ul style="list-style-type: none">- UPPER ARM- LOWER ARM See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.
The adjustment of the UPPER RACK prevents the PUSHER BLADE on the LOWER RACK from engaging the slide. The PUSHER BLADE on the LOWER RACK has wear, or the LOWER RACK has other damage.	Check that the UPPER RACK is adjusted correctly. See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual. <ul style="list-style-type: none">- Check that the edge of the PUSHER BLADE is 0.91 to 0.99 mm (0.036 to 0.039 in.) high.- Check the LOWER RACK for other damage.- If necessary, install a replacement for the LOWER RACK. See the removal and installation procedures in Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual. IMPORTANT: If a replacement for the LOWER RACK is installed, do the following adjustments and procedures in the given sequence: <ul style="list-style-type: none">HOME SENSOR/LOWER RACKUPPER RACKUPPER ARMLOWER ARMD_R ProcedureCorrection Factors Procedure, if necessaryFull wet calibration
The metal surfaces of the slide path are rough or damaged, causing slide jams.	Check the slide path for damage. Repair, or install replacement parts as necessary.

To Check for Correct Operation:

To check that the malfunction is repaired, process a slide in the *DT60* ANALYZER. If Error Code F12 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were cancelled when the PIPETTE LOCATOR COVER was lifted.

Possible Causes	Recommended Actions
The SURFACE PLATE is damaged or is not installed correctly, causing slide jams.	<ul style="list-style-type: none"> - Check that the REFERENCE EDGE of the SURFACE PLATE is not damaged. If necessary, install a replacement for the SURFACE PLATE. - Check that the SURFACE PLATE is flush with the SPOTTING STATION, within 0.127 mm (0.005 in.). The SURFACE PLATE should not be lower than the SPOTTING STATION. - Check that the SURFACE PLATE is fastened down onto the MECHANICAL MODULE. 2 LOCK WASHERS, part No. 188828, should be installed with the 2 SCREWS. The LOCK WASHERS are necessary to prevent the SCREWS from touching the bottom in the INSERTS before the SURFACE PLATE touches the surface of the MECHANICAL MODULE. See the figure on page 115. - Check that the GAP between the SURFACE PLATE and the SPOTTING STATION is approximately 0.890 mm (0.035 in.). If necessary, loosen the SCREWS and adjust the position of the SURFACE PLATE.
CONNECTOR J28 from the SLIDE DETECTOR SENSOR to the MOTHER BOARD or the MASTER BOARD is not seated correctly.	Disconnect and connect CONNECTOR J28, checking that it is seated correctly.
The SLIDE DETECTOR SENSOR has a malfunction.	<ul style="list-style-type: none"> - Lift the PAWLS and observe the "SLIDE" LED on the DRIVER BOARD or on the MASTER BOARD. - If the LED is energized when the PAWL is up, the SLIDE DETECTOR SENSOR operates correctly. - If the LED does not energize, or if it is continually energized, install a replacement for the SLIDE DETECTOR SENSOR.
The voltage for the SLIDE DETECTOR SENSOR is not adjusted correctly.	Use a WHITE REFERENCE SLIDE TL-3344 and adjust the SLIDE DETECTOR SENSOR. See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.
The LOWER RACK is not adjusted correctly.	Do the adjustment procedure for the HOME SENSOR and LOWER RACK. See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.

E093-0237DCA
E093-0237DCA

Error Code F12 - Continued

Possible Causes	Recommended Actions
The FLAG that inserts into the SLIDE DETECTOR SENSOR is bent or broken.	<p>Install a replacement for the FORS WEIGHT ASSEMBLY. See the removal and installation procedures in Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.</p> <p>IMPORTANT: If a new FORS WEIGHT ASSEMBLY is installed, do the following adjustments and procedures:</p> <ul style="list-style-type: none"> SLIDE DETECTOR SENSOR - Adjustment INCUBATOR - Temperature Adjustment FORS WEIGHT ASSEMBLY - Checkout Process control fluids for AMYL, BUN, CREA, Hb, and NH₃. <p>See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.</p>
The FORS WEIGHT ASSEMBLY binds on the PIVOT PIN and is lifted up so that the PAWL does not touch the slide path. A slide moving under the PAWLS does not lift the RIGHT-HAND PAWL high enough to place the FLAG in the SLIDE PRESENT SENSOR.	<ul style="list-style-type: none"> - Check that the FORS WEIGHT ASSEMBLY does not bind when it is placed in the position for slide processing. A Type 1 FORS WEIGHT ASSEMBLY might bind if the wires are not in the correct positions. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual. - If necessary, install a Type 2 FORS WEIGHT ASSEMBLY as a replacement for the Type 1 FORS WEIGHT. The Type 2 FORS WEIGHT has a PLATE to keep the wires in the correct positions. - Check that the PIVOT PIN is installed correctly, is clean, and is not damaged. Repair any damage, or clean the PIVOT PIN as necessary.

Error Code F13

To Check for Correct Operation:

To check that the malfunction is repaired, process a slide in the DT60 ANALYZER. If Error Code F13 does not occur again, the diagnostic procedure is completed and the DT60 ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

Possible Causes	Recommended Actions
The SLIDE DETECTOR SENSOR has a malfunction.	<ul style="list-style-type: none"> - Lift the PAWLS and observe the "SLIDE" LED on the DRIVER BOARD or on the MASTER BOARD. - If the LED is energized when the PAWL is up, the SLIDE DETECTOR SENSOR operates correctly. - If the LED does not energize, or if it is continually energized, install a replacement for the SLIDE DETECTOR SENSOR. See the removal and installation procedures in Parts and Removals for the DT60 ANALYZER, section 10 in this service manual. <p>IMPORTANT: If a new SLIDE DETECTOR SENSOR is installed, the following adjustments must be checked:</p> <ul style="list-style-type: none"> SLIDE DETECTOR SENSOR INCUBATOR - Temperature
The voltage for the SLIDE DETECTOR SENSOR is not adjusted correctly.	<p>Use a WHITE REFERENCE SLIDE TL-3344 and adjust the SLIDE DETECTOR SENSOR.</p> <p>See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.</p>
The RIGHT-HAND PAWL has a bind and does not move correctly.	<ul style="list-style-type: none"> - Check that the SHROUDS are installed correctly on the FORS WEIGHT ASSEMBLY. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual. - Check that the PAWLS are clean and have no adhesive material on the surface to hold them in the lifted position. - Check the PAWL and the PIN that holds the PAWL for damage. If the damage cannot be repaired, install a replacement for the FORS WEIGHT ASSEMBLY. See the removal and installation procedures in Parts and Removals for the DT60 ANALYZER, section 10 in this service manual. <p>IMPORTANT: If a new FORS WEIGHT ASSEMBLY is installed, do the following adjustments and procedures:</p> <ul style="list-style-type: none"> SLIDE DETECTOR SENSOR - Adjustment INCUBATOR - Temperature Adjustment FORS WEIGHT ASSEMBLY - Checkout Process control fluids for AMYL, BUN, CREA, Hb, and NH₃. <p>See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.</p>
The metal surfaces of the slide path are rough or damaged, preventing the previous slide from being fully ejected and causing slide jams.	<p>Check the slide path for damage. Repair, or install replacement parts as necessary.</p>

Error Code F13 - Continued

To Check for Correct Operation:

To check that the malfunction is repaired, process a slide in the *DT60* ANALYZER. If Error Code F13 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

Possible Causes	Recommended Actions
The LOWER ARM is not adjusted correctly. The RIGHT-HAND PAWL is lifted and does not fall into the RECESS on the LOWER RACK when the slide has moved into the READ STATION.	Check that the LOWER ARM is adjusted correctly. See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.
The FORS WEIGHT ASSEMBLY binds on the PIVOT PIN and the position is too low. The PAWL will not move low enough after the slide has been moved into position in the READ STATION.	<ul style="list-style-type: none"> - Check that the FORS WEIGHT ASSEMBLY does not bind when it is placed in the position for slide processing. A Type 1 FORS WEIGHT ASSEMBLY might bind if the wires are not in the correct positions. See the removal and installation procedures in Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual. - If necessary, install a Type 2 FORS WEIGHT ASSEMBLY as a replacement for the Type 1 FORS WEIGHT. The Type 2 FORS WEIGHT has a PLATE to keep the wires in the correct positions. <p>IMPORTANT: If a new FORS WEIGHT ASSEMBLY is installed, do the following adjustments and procedures:</p> <ul style="list-style-type: none"> SLIDE DETECTOR SENSOR - Adjustment INCUBATOR - Temperature Adjustment FORS WEIGHT ASSEMBLY - Checkout Process control fluids for AMYL, BUN, CREA, Hb, and NH₃. <p>See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.</p> <ul style="list-style-type: none"> - Check that the PIVOT PIN is installed correctly, is clean, and is not damaged. Repair any damage, or clean the PIVOT PIN as necessary.
The software did not monitor correctly the number of steps made by the MOTOR AND PINION ASSEMBLY. This condition might occur when Option 29 is executed in units with version 11.0 software installed.	<p>Do the DR Procedure or the Correction Factors Procedure again, but do not use Option 29. Use the procedure for versions 9.0 and 10.7 software.</p> <p>If Error Code F13 does not occur when Option 29 is not used, provide the information to the Customer Support Center in Rochester. The telephone number is: 800/521-0098</p>

Error Code F14

To Check for Correct Operation:

To check that the malfunction is repaired, process a slide in the *DT60* ANALYZER. If Error Code F14 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

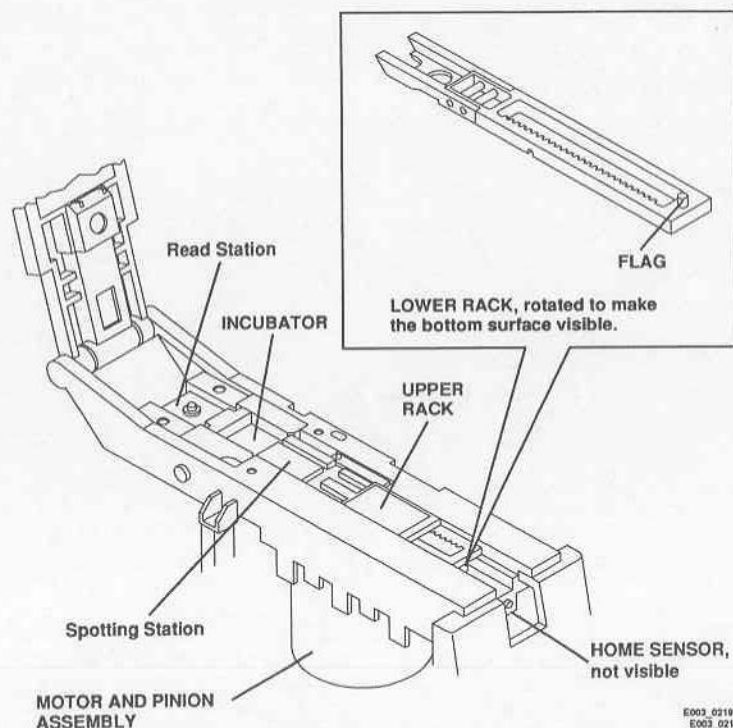
Possible Causes	Recommended Actions
The SLIDE DETECTOR SENSOR has a malfunction.	<ul style="list-style-type: none"> - Lift the PAWLS and observe the "SLIDE" LED on the DRIVER BOARD or on the MASTER BOARD. - If the LED is energized when the PAWL is up, the SLIDE DETECTOR SENSOR operates correctly. - If the LED does not energize, or if it is continually energized, install a replacement for the SLIDE DETECTOR SENSOR. See the removal and installation procedures in Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual. <p>IMPORTANT: If a new SLIDE DETECTOR SENSOR is installed, the following adjustments must be checked:</p> <ul style="list-style-type: none"> SLIDE DETECTOR SENSOR INCUBATOR - Temperature
CONNECTOR J28 from the SLIDE DETECTOR SENSOR to the MOTHER BOARD or the MASTER BOARD is not seated correctly.	Disconnect and connect CONNECTOR J28, checking that it is seated correctly.
The PAWLS remained in the lifted position after the MOTOR reversed to move the LOWER RACK to the home-position.	<ul style="list-style-type: none"> - Check the PAWLS for damage. If the damage cannot be repaired, install a replacement for the FORS WEIGHT ASSEMBLY. - Check that the SHROUDS are installed correctly on the FORS WEIGHT ASSEMBLY. See the Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual. - Check that the PAWLS are clean and have no adhesive material on the surface to hold them in the lifted position.

**Error Codes F15 and F16 — "TRANSFER MALFUNCTION", and
Error Code F19 — "MECHANISM ERROR"**

DT60 ANALYZER

Description

A HOME SENSOR installed under the TRACK ASSEMBLY allows the software in the DT60 ANALYZER to monitor the position of the LOWER RACK. In normal operation, the MOTOR AND PINION ASSEMBLY drives the UPPER RACK and the LOWER RACK in opposite directions to move slides from the SPOTTING STATION to the INCUBATOR and from the INCUBATOR to the READ STATION. When the FLAG on the bottom of the LOWER RACK enters the HOME SENSOR, the SENSOR sends a logic Hi signal of approximately +5 V dc to the computer. This condition is the home-position for the LOWER RACK and the UPPER RACK. When the FLAG is not in the HOME SENSOR, the SENSOR sends a logic Lo signal of approximately 0 V to the computer.

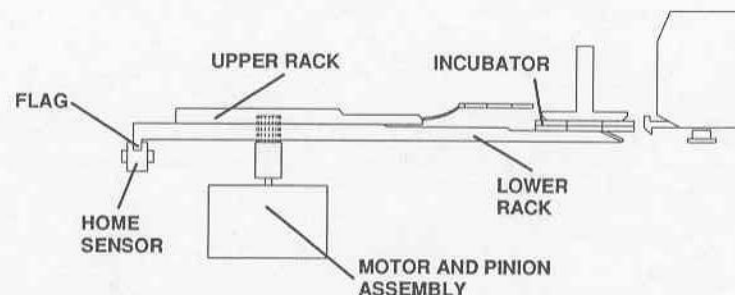


View of the TRACK ASSEMBLY without the SURFACE PLATE

The software also monitors the MOTOR AND PINION ASSEMBLY for the number of steps from and to the home-position. The software expects to detect a given number of steps in each direction, within given ranges, when the FLAG on the LOWER RACK moves from and returns to the HOME SENSOR.

In version 9.0 software, when the signal from the HOME SENSOR changes from logic Lo to logic Hi, the step count for the MOTOR AND PINION ASSEMBLY is reset to "0". The software allows 3 additional steps, or 1.79 mm (0.070 in.), for the FLAG to move through the HOME SENSOR when the RACKS are driven in the opposite direction.

In versions 10.7 and 11.0 software, when the UPPER RACK returns from the INCUBATOR, the MOTOR AND PINION ASSEMBLY drives the LOWER RACK an additional 10 steps through the HOME SENSOR after the first change from logic Lo to logic Hi. Then the MOTOR AND PINION ASSEMBLY reverses the direction and drives the LOWER RACK until the logic changes from Lo to Hi again. The step count is reset to "0" only when the FLAG on the LOWER RACK enters the HOME SENSOR from the side toward the INCUBATOR.



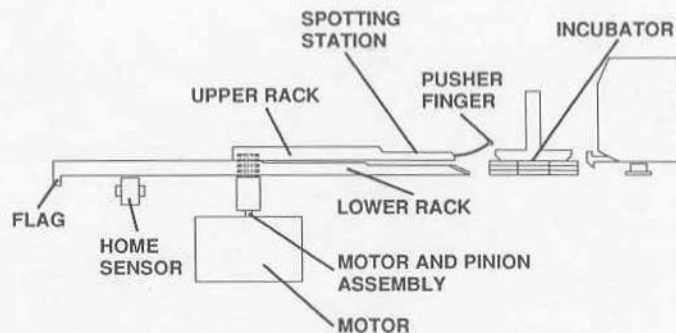
Cross-Section View of the UPPER RACK and the LOWER RACK in Home-Position

E003_0170BCA
E003_0170BC

E001_0210DCA
E003_0210DC

Description, continued

To move a slide from the SPOTTING STATION into the INCUBATOR, the MOTOR AND PINION ASSEMBLY drives the LOWER RACK from "0" to step -62. The UPPER RACK is moved toward the INCUBATOR. The PUSHER FINGER pushes the slide into the INCUBATOR. Then the MOTOR is reversed and the LOWER RACK and the UPPER RACK return the original positions. The steps are monitored in each direction.



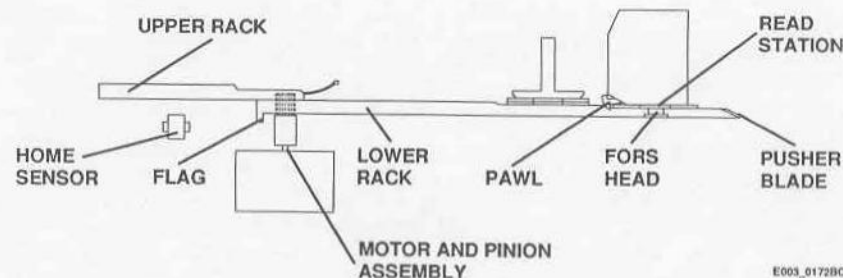
E003_0171BCA
E003_0171BC

Cross-Section View of UPPER RACK and LOWER RACK In Position after Metering

Description, continued

To move a slide from the INCUBATOR to the READ STATION, the MOTOR AND PINION ASSEMBLY drives the LOWER RACK toward the READ STATION. A PUSHER BLADE on the LOWER RACK pushes the slide under the PAWLS in the FORS WEIGHT and over the FORS HEAD. The MOTOR AND PINION ASSEMBLY moves the LOWER RACK approximately 5 steps beyond the READ STATION, then reverses the direction to push the slide against the back of the PAWLS. The slide remains in position over the FORS HEAD and the LOWER RACK continues to move to the home-position.

If the MOTOR AND PINION ASSEMBLY operates against a bind in the Slide Transport System, the ROTOR continues to rotate and advance the step count, but the RACKS do not advance. This condition might cause the software to detect more steps when the MOTOR AND PINION ASSEMBLY operates in one direction than in the other direction.



E003_0172BCA
E003_0172BC

Cross-Section View of the UPPER RACK and the LOWER RACK In READ STATION Position

Description, Error Code F15

The MOTOR AND PINION ASSEMBLY drives from step "0" to step -62 to move the UPPER RACK from the home-position to the INCUBATOR. If the signal from the HOME SENSOR changes from logic Lo to logic Hi after the MOTOR AND PINION ASSEMBLY has made **less than 57 steps** to move the UPPER RACK to the home-position again, Error Code F15 is displayed on the printout. The operation of the DT60 ANALYZER is stopped. Error Code F15 can occur during initialization or when slides are processed. See the figures on page 125.

Description, Error Code F16

IMPORTANT

This error code does not normally occur. Error Code F12 should occur before the conditions that cause Error Code F16 can occur.

The software program has an Error Code F16, but the conditions that might cause F16 will not occur if the software for Error Code F12 operates correctly. See the description and the diagnostic table for Error Code F12.

The MOTOR AND PINION ASSEMBLY drives from step "0" to step +91, +92, +93, or +94 to move the LOWER RACK to the READ STATION. If the signal from the HOME SENSOR changes from logic Lo to logic Hi after the MOTOR AND PINION ASSEMBLY has made **less than 91 steps** to move the LOWER RACK to the home-position again, Error Code F16 is displayed on the printout. The operation of the DT60 ANALYZER is stopped. A simulation of Error Code F16 can be done by inserting a paper into the HOME SENSOR during the travel of the LOWER RACK from the READ STATION to the home-position. An intermittent Error Code F16 might occur if the HOME SENSOR is loosened and the focus of the PHOTODIODE changes during the Slide Transport cycle.

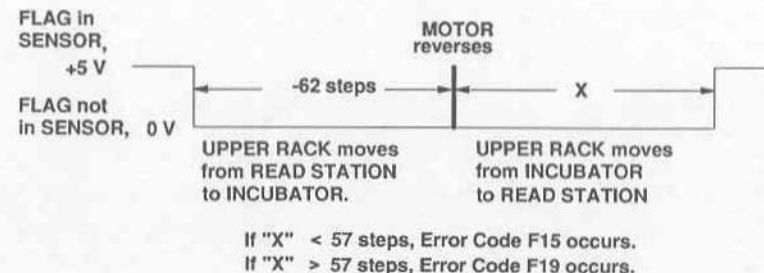
Description, Error Code F19

Error Code F19 indicates that the number of steps to return the RACKS to the home-position exceeded the software limits.

If the MOTOR AND PINION ASSEMBLY is moving the UPPER RACK from the INCUBATOR to the home-position, the software allows **57 steps + 10 additional steps**. Error Code F19 is displayed on the printout, and the operation of the DT60 ANALYZER is stopped **if the signal from the HOME SENSOR does not change from logic Lo to logic Hi before step 68**.

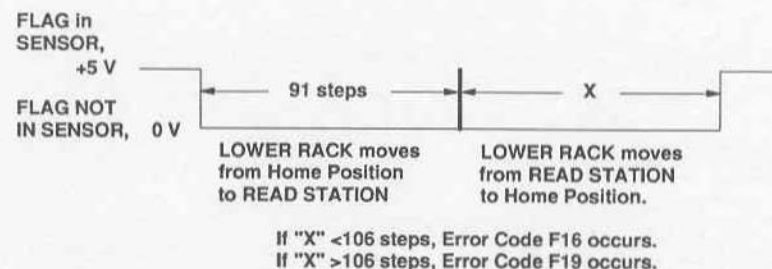
If the MOTOR AND PINION ASSEMBLY is moving the LOWER RACK from the READ STATION to the home-position, the software allows **91 steps + 15 additional steps**. Error Code F19 is displayed on the printout, and the operation of the DT60 ANALYZER is stopped **if the signal from the HOME SENSOR does not change from logic Lo to logic Hi before step 107**. See the figures on page 125.

Error Code F19 can occur either during initialization or when slides are processed. If the SLIDE PRESENT SENSOR malfunctions and remains continually in the Hi status, Error Code F19 will occur during initialization.



E003_0220BCA
E003_0220B6C

Normal Status of the HOME SENSOR:
UPPER RACK Moves between Home-Position and INCUBATOR



E003_0220BCB
E003_0220B6C

Normal Status of the HOME SENSOR:
LOWER RACK Moves between Home-Position and READ STATION

Tools and Materials:

MULTIMETER TL-3424
FEELER GAUGES TL-1384 or TL-2372

Possible Replacement Parts:

For Both Configurations:

INCUBATION CHAMBER 352531
UPPER RACK - Order as RACK AND PUSHER FINGER ASSEMBLY 613907
SURFACE PLATE 613825
SCREWS 179061 and LOCK WASHERS 188828, or Self-Tapping SCREWS 486527
HOME/SLIDE SENSOR 350247 - to be used for the HOME SENSOR and the
SLIDE DETECTOR SENSOR
MOTOR AND PINION ASSEMBLY 613908

For Multi-Board Configuration:

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software
I/O CIRCUIT BOARD ASSEMBLY 352520, for Version 10.7 Software and above
DRIVER CIRCUIT BOARD ASSEMBLY 352387
MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

Additional Information:

DT60 ANALYZER

Adjustments and Special Procedures
Diagrams
Parts/Removals

Specifications for the Adjustment of the HOME SENSOR and LOWER RACK:

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at **step +86**, and
- move down off the TRAILING EDGE of the slide at **step +87, +88, or +89.**

Specifications for the Adjustment of the UPPER RACK:

Execute Option 68 for **-59 steps**, and measure 0.152 to 1.54 mm (0.005 to 0.023 in.) between the PUSHER FINGER and the INCUBATOR.

Specifications for the Adjustment of the LOWER ARM:

- When the UPPER RACK is in the home-position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance, and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

Specifications for the Adjustment of the Height of the UPPER ARM:

When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

NOTE

For a Type 1 PRESSURE PAD, the **step count is +20.**

For a Type 2 PRESSURE PAD, the **step count is +70.**

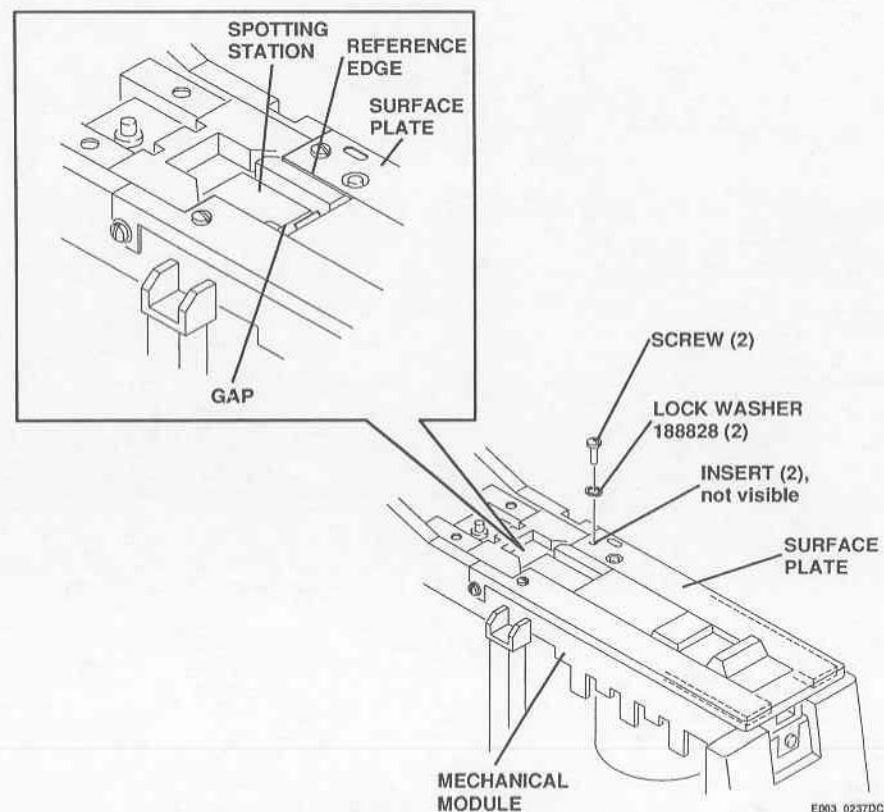
With the RACKS in the home-position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

To Check for Correct Operation:

To check that the malfunction is repaired, operate the *DT60* ANALYZER with a slide. If Error Code F15 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

Possible Causes	Recommended Actions
A slide jam prevents the UPPER RACK from extending fully to the INCUBATOR.	Operator action: Lift the PIPETTE LOCATOR and clear any slide jam. Process the test again. If the error code occurs again, the customer should call for service.
The UPPER RACK or the LOWER CHAMBER of the INCUBATOR is damaged or has a rough surface, causing a slide jam.	Check the UPPER RACK and the INCUBATOR CHAMBER for damage or rough surfaces. If necessary, repair or install a replacement part. See Parts and Removals for the <i>DT60</i> ANALYZER, section 10.
The SURFACE PLATE is damaged or is not installed correctly, causing slide jams.	<ul style="list-style-type: none"> - Check that the REFERENCE EDGE of the SURFACE PLATE is not damaged. If necessary, install a replacement for the SURFACE PLATE. - Check that the SURFACE PLATE is flush with the SPOTTING STATION, within 0.127 mm (0.005 in.). The SURFACE PLATE should not be lower than the SPOTTING STATION. - Check that the SURFACE PLATE is fastened down onto the MECHANICAL MODULE. 2 LOCK WASHERS, part No. 188828, should be installed with the 2 SCREWS. The LOCK WASHERS are necessary to prevent the SCREWS from touching the bottom in the INSERTS before the SURFACE PLATE touches the surface of the MECHANICAL MODULE. See the figure on page 129. - Check that the GAP between the SURFACE PLATE and the SPOTTING STATION is approximately 0.890 mm (0.035 in.) to allow the PUSHER FINGER to move freely. If necessary, loosen the SCREWS and adjust the position of the SURFACE PLATE.
A bent or damaged PUSHER FINGER causes a slide jam.	<p>Check the condition of the PUSHER FINGER on the UPPER RACK. If the PUSHER FINGER is bent or damaged, or if it does not move freely up and down, install a new UPPER RACK ASSEMBLY. See the removal and installation procedures in Parts and Removals for the <i>DT60</i> ANALYZER, section 10 in this service manual.</p> <p>NOTE: The PUSHER FINGER should move freely in the CHANNEL and up and down on the PIVOT.</p>

Possible Causes	Recommended Actions
A bind in the PRESSURE PAD, the LOWER ARM, or the UPPER ARM causes a jam of the UPPER RACK and the LOWER RACK.	<p>Check that the following parts are adjusted correctly:</p> <p>LOWER RACK</p> <p>UPPER RACK</p> <p>LOWER ARM, if it can be adjusted</p> <p>UPPER ARM</p> <p>See Adjustments and Special Procedures, section 8 in the service manual.</p>



Error Code F15 - Continued

To Check for Correct Operation:

To check that the malfunction is repaired, operate the *DT60* ANALYZER with a slide. If Error Code F15 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

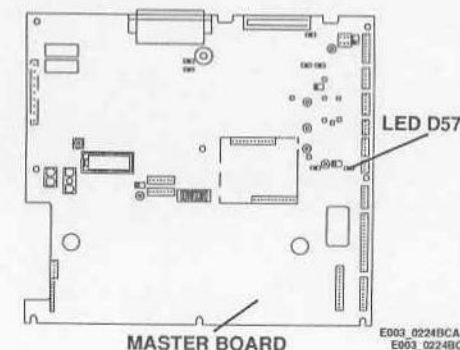
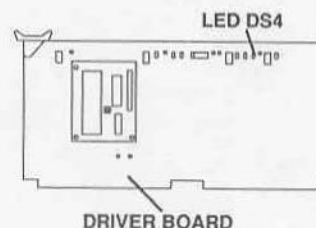
Possible Causes	Recommended Actions
The HOME SENSOR is not installed correctly.	Check the SCREWS on the MOUNTING BRACKET for the HOME SENSOR. If the SCREWS are tightened excessively, the SENSOR might bend and cause the focus of the PHOTODIODE to change during the motion of the LOWER RACK. NOTE: Check the installation of the HOME SENSOR if Error Code F15 occurs intermittently.
The CONNECTOR for the HOME SENSOR is not seated correctly.	Check that CONNECTOR J19 is seated correctly on the MOTHER BOARD or the MASTER BOARD. If necessary, clean or repair the contact surfaces on J19 and P19.
The ELEMENTS for the HOME SENSOR are loosened, or have a malfunction.	To check the ELEMENTS for the HOME SENSOR: - Disconnect CONNECTOR J16 for the MOTOR AND PINION ASSEMBLY and manually move the LOWER RACK until the FLAG is not in the HOME SENSOR. Check that DS4 on the DRIVER BOARD or DS7 on the MASTER BOARD deenergizes when the FLAG is moved from the HOME SENSOR. With minimum force, hit the top of the TRACK ASSEMBLY above the HOME SENSOR. If LED DS4 or DS7 flickers, install a new HOME SENSOR. - If the LED does not flicker, see the Interconnect diagram for the HOME SENSOR, either Multi-Board or Single-Board configuration, and diagnose the malfunction. Repair or install replacements for the following parts as necessary: <div style="display: flex; justify-content: space-between;"> <div> <u>Multi-Board:</u> I/O BOARD DRIVER BOARD MOTHER BOARD </div> <div> <u>Single-Board:</u> MASTER BOARD </div> </div>
The MOTOR AND PINION ASSEMBLY, or the drive circuit for the MOTOR AND PINION ASSEMBLY, has a malfunction.	- Check that CONNECTOR J16 for the MOTOR AND PINION ASSEMBLY is seated correctly on the MOTHER BOARD or the MASTER BOARD. - Use the Interconnect diagram for the MOTOR AND PINION ASSEMBLY, either Multi-Board or Single-Board, to diagnose a malfunction. Repair or install replacements for the following parts as necessary: <div style="display: flex; justify-content: space-between;"> <div> <u>Multi-Board:</u> I/O BOARD DRIVER BOARD MOTHER BOARD </div> <div> <u>Single-Board:</u> MASTER BOARD </div> </div>

Error Code F16

To Check for Correct Operation:

To check that the malfunction is repaired, operate the *DT60* ANALYZER with a slide. If Error Code F16 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

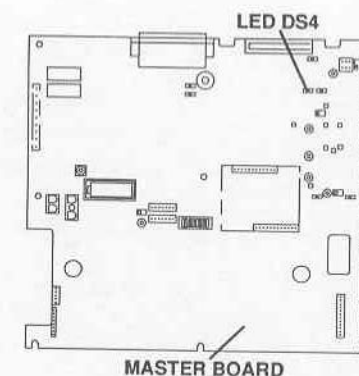
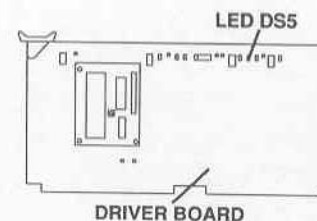
Possible Causes	Recommended Actions
The circuits for the HOME SENSOR are loosened or have a malfunction.	To check the circuits for the HOME SENSOR: - Disconnect CONNECTOR J16 for the MOTOR AND PINION ASSEMBLY and manually move the LOWER RACK until the FLAG is not in the HOME SENSOR. Check that DS4 on the DRIVER BOARD or DS7 on the MASTER BOARD deenergizes when the FLAG is moved from the HOME SENSOR. With minimum force, hit the top of the TRACK ASSEMBLY above the HOME SENSOR. If LED DS4 or DS7 flickers, install a new HOME SENSOR. - If the LED does not flicker, see the Interconnect diagram for the HOME SENSOR, either Multi-Board or Single-Board configuration, and diagnose the malfunction. Repair or install replacements for the following parts as necessary: <div style="display: flex; justify-content: space-between;"> <div> <u>Multi-Board:</u> I/O BOARD DRIVER BOARD MOTHER BOARD </div> <div> <u>Single-Board:</u> MASTER BOARD </div> </div>



To Check for Correct Operation:

To check that the malfunction is repaired, operate the *DT60 ANALYZER* with a slide. If Error Code F19 does not occur again, the diagnostic procedure is completed and the *DT60 ANALYZER* is repaired. Process new slides for the test that was not completed when the malfunction occurred, and for any other tests that were deleted when the PIPETTE LOCATOR COVER was lifted.

Possible Causes	Recommended Actions
The SLIDE PRESENT SENSOR has a malfunction and remains in a logic Hi status.	Check the status of LED DS5 on the DRIVER BOARD, or DS4 on the MASTER BOARD. Manually move the right PAWL up and down. If the LED remains energized continually, install a replacement for the SLIDE PRESENT SENSOR.
The HOME SENSOR is not installed correctly.	Check the SCREWS on the MOUNTING BRACKET for the HOME SENSOR. If the SCREWS are tightened excessively, the SENSOR might bend and cause the focus of the PHOTODIODE to change during the motion of the LOWER RACK. NOTE: Check the installation of the HOME SENSOR if Error Code F15 occurs intermittently.
The CONNECTOR for the HOME SENSOR is not seated correctly.	Check that CONNECTOR J19 is seated correctly on the MOTHER BOARD or the MASTER BOARD. If necessary, clean or repair the contact surfaces on J19 and P19.
A bent or damaged PUSHER FINGER causes a slide jam.	Check the condition of the PUSHER FINGER on the UPPER RACK. If the PUSHER FINGER is bent or damaged, or if it does not move freely up and down, install a new UPPER RACK ASSEMBLY. See the removal and installation procedures in Parts and Removals for the <i>DT60 ANALYZER</i> , section 10 in the service manual. NOTE: The PUSHER FINGER should move freely in the CHANNEL and up and down on the PIVOT.
A bind in the PRESSURE PAD, the LOWER ARM, or the UPPER ARM causes a jam of the UPPER RACK and the LOWER RACK.	Check that the following parts are adjusted correctly: LOWER RACK UPPER RACK LOWER ARM, if it can be adjusted UPPER ARM See Adjustments and Special Procedures, section 8 in the service manual.



E003_0224BCB
E003_0224BC

Error Code F17 — "LINE VOLTAGE TOO LOW"

DT60 ANALYZER

Description

Error Code F17 occurs when the ac power to the *DT60* ANALYZER is low. This condition is detected by the small BROWNOUT BOARD installed vertically on the POWER SUPPLY. On older POWER SUPPLY ASSEMBLIES, the BROWNOUT BOARD can be removed. Newer POWER SUPPLY ASSEMBLIES have the BROWNOUT BOARD soldered in position so that it cannot be removed. See Parts and Removals for the *DT60* ANALYZER, section 10 of this service manual.

The BROWNOUT BOARD is adjusted at KAD. The factory adjustment is 81 to 85 V ac with the "120/240" SWITCH in the "120" position. For sites with 240 V power, the factory adjustment should provide a voltage measurement of 168 to 188 V ac with the SWITCH in the "240" position.

If the line voltage to the *DT60* ANALYZER is less than 83 V ac when the "120/240" SWITCH is set for 120 V, or less than 178 V ac when the SWITCH is set for 240 V, Error Code F17 is displayed in the LC DISPLAY.

CAUTION

Do not adjust POTENTIOMETER R26 in the field.

Tools and Materials:

MULTIMETER TL-3424
CONTACT LUBRICANT TL-3773

Possible Replacement Parts, *DT60* ANALYZER:

POWER SUPPLY ASSEMBLY 616818

Additional Information:

Adjustments and Special Procedures - *DT60* ANALYZER

Special Procedure - Applying CONTACT LUBRICANT TL-3773

Site Specifications

Specifications for the External Power:

"120/240" SWITCH	
SWITCH - Position	Voltage Range
"120"	90 to 132 V ac
"240"	189 to 264 V ac

Error Code F17

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the *DT60* ANALYZER again. If Error Code F17 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired.

Possible Causes	Recommended Actions
The ac power at the site is not within the operating specifications for the equipment.	<ul style="list-style-type: none"> - Check that the input line voltage is within the specifications for external power. See the specifications on the previous page. - Check for continuity of the earth ground. - Provide information about the site specifications to the customer. The customer is expected to provide site conditions that are within the operation specifications for the equipment. - If necessary, locate and use another source of power at the site for the <i>DT60</i> ANALYZER.
The BROWNOUT BOARD is not seated correctly in CONNECTOR J2.	<p>NOTE: The BROWNOUT BOARD might be soldered onto the POWER SUPPLY.</p> <p>If the BROWNOUT BOARD is not soldered in position, remove it and install it again.</p>
CONNECTOR P2 on the MOTHER BOARD or the MASTER BOARD has corrosion.	If necessary, do the special procedure, "Applying CONTACT LUBRICANT TL-3773". See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8.
The BROWNOUT BOARD has a malfunction.	<ul style="list-style-type: none"> - Install a new POWER SUPPLY ASSEMBLY. - Do the checkout procedure for the POWER SUPPLY. See Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in this service manual.

Error Code F18 — "PRINTER MALFUNCTION"

DT60 ANALYZER

Description

If a printout is necessary for any operation of the DT SYSTEM, the computer sends a command signal to the PRINTER MOTOR to move the PRINT HEAD. The PRINT HEAD is expected:

- to move from the home-position within 4 seconds after the command signal, and
- to be in the home-position within 4 seconds after the PRINTER MOTOR starts.

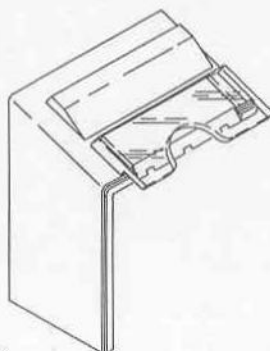
The computer monitors the position of the PRINT HEAD by monitoring the status of the PRINTER HOME SWITCH. In normal operation, the PRINT HEAD is in the home-position at the following times:

- when the PRINTER is not operating, or
- within 3 to 4 seconds after the PRINTER MOTOR started to move the PRINT HEAD to print one line of information.

If the PRINT HEAD is not in the home-position when the computer expects a signal from the PRINTER HOME SWITCH, Error Code F18 is displayed in the LC DISPLAY. A paper jam can prevent the PRINT HEAD from being in the correct position at the expected time.

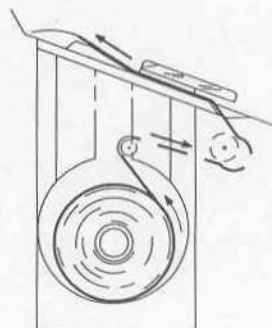
IMPORTANT

If paper jams cause frequent error codes, installation of the new PRINTER COVER/TEAR BAR ASSEMBLY 352358 might decrease the paper jams.



E003_0195AC

PRINTER COVER/TEAR BAR ASSEMBLY 352358



E003_0106AC

Loading the Paper Tape

Special Tools:

MULTIMETER TL-3424

Possible Replacement Parts, DT60 ANALYZER:

PRINTER ASSEMBLY 613960

Includes: PRINTER COVER/TEAR BAR ASSEMBLY 352358

PRINTER INTERFACE BOARD 613957

DRIVER BOARD 352387 for Multi-Board configuration

MASTER BOARD 352658 for Single-Board configuration

POWER SUPPLY ASSEMBLY 616818

Additional Information:

Adjustments and Special Procedures - DT60 ANALYZER

Special Procedure - "POWER SUPPLY - Checkout"

Diagrams - DT60 ANALYZER

Voltage Specification - PRINTER:

The input voltage to the PRINTER measured between PIN 4 and PIN 5 on CONNECTOR J34 should be 5.0 V dc.

MULTIMETER TL-3424	
+	Ground
CONNECTOR J34, PIN 4	CONNECTOR J34, PIN 5

Error Code F18

To Check for Correct Operation:

To check that the malfunction is repaired, initialize the *DT60* ANALYZER again. Then execute Option 4 a minimum of 4 times. If Error Code F18 does not occur again, the diagnostic procedure is completed and the *DT60* ANALYZER is repaired.

Possible Causes	Recommended Actions
The PRINTER has a paper jam, or a small particle of paper is causing an obstruction to the motion of the PRINT HEAD.	<ul style="list-style-type: none"> - Remove the paper jam. - If necessary, install the new PRINTER COVER/TEAR BAR ASSEMBLY 352358. This part prevents particles of paper tape from falling into the PRINTER ASSEMBLY.
CONNECTOR J34 for the PRINTER MOTOR is not seated correctly on the MOTHER BOARD or the MASTER BOARD.	Disconnect CONNECTOR J34 and seat it again.
<ul style="list-style-type: none"> - The PRINTER HOME SWITCH has a malfunction. - The TEFLON STRIP is damaged. - The ACTUATOR PIN for the PRINTER HOME SWITCH is broken. 	Install a new PRINTER ASSEMBLY.
The input voltage to the PRINTER is less than the specification.	<ul style="list-style-type: none"> - Check that the voltage between PIN 4 and PIN 5 on CONNECTOR J34 is 5 V dc. - If the voltage at CONNECTOR J34 is not correct, check for 5 V dc input voltage to the PRINTER. See the diagrams for the <i>DT60</i> ANALYZER. - If the voltage is not correct, do the checkout procedure for the POWER SUPPLY. See the Adjustments and Special Procedures for the <i>DT60</i> ANALYZER, section 8 in the service manual.
The PRINTER INTERFACE BOARD is not seated correctly or has a malfunction.	<ul style="list-style-type: none"> - Remove the PRINTER INTERFACE BOARD and seat it correctly. - If necessary, install a replacement for the PRINTER INTERFACE BOARD.
For Multi-Board Configuration only: The DRIVER BOARD is not seated correctly or has a malfunction.	<ul style="list-style-type: none"> - Remove the DRIVER BOARD and seat it correctly. - If necessary, install a replacement for the DRIVER BOARD.
The PRINTER MOTOR does not operate, or does not operate correctly.	<ul style="list-style-type: none"> - Seat the CONNECTORS for the PRINTER MOTOR again. - Execute Option 4 and check that the PRINTER MOTOR operates. - See the Diagrams for the <i>DT60</i> ANALYZER and diagnose the malfunction. If necessary, install a replacement for the PRINTER.
The initialization for the <i>DT60</i> ANALYZER was not fully completed after Error Code F18 was displayed on the LC DISPLAY.	Move the MAIN POWER SWITCH to the "0" position. <u>Wait 5 seconds</u> , then move the SWITCH to the "1" position.

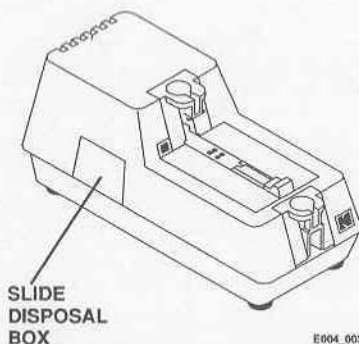
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Error Code F20 — "TRANSFER MALFUNCTION"

DTE MODULE

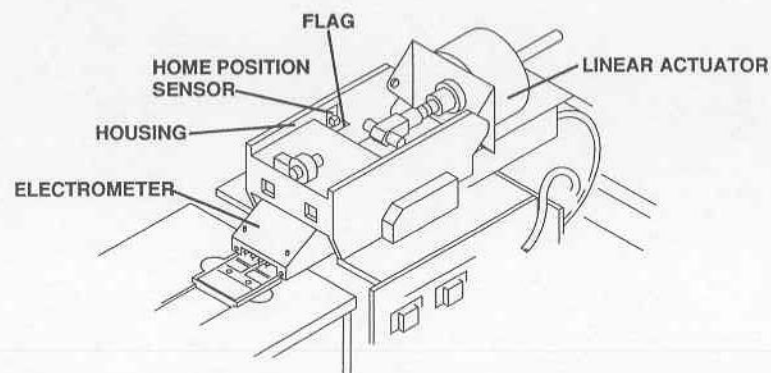
Description

In the DTE MODULE, the slide is moved manually to the SPOTTING STATION and remains in that position until the next slide is inserted. The next slide pushes the first slide from the SPOTTING STATION into the SLIDE DISPOSAL BOX. After the metering is completed, the LINEAR ACTUATOR moves the ELECTROMETER BOX ASSEMBLY to the slide. The ELECTROMETER moves down to allow the BOOT to seal the fluids on the slide. The CONTACTS touch the 2 ELECTRODES on the slide and, after the incubation time is completed, a reading is made.



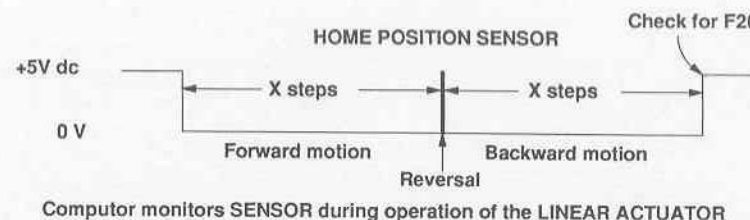
E004_0034ACA
E004_0034AC

A HOME POSITION SENSOR installed on the HOUSING, and a FLAG installed on the ELECTROMETER, allow the software in the DT60 ANALYZER to monitor and control the home-position for the ELECTROMETER. In normal operation, the LINEAR ACTUATOR drives the ELECTROMETER forward from the home-position to the SPOTTING STATION. After the slide reading is completed, the LINEAR ACTUATOR reverses to drive the ELECTROMETER from the SPOTTING STATION to the home-position.



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E004_0061BC

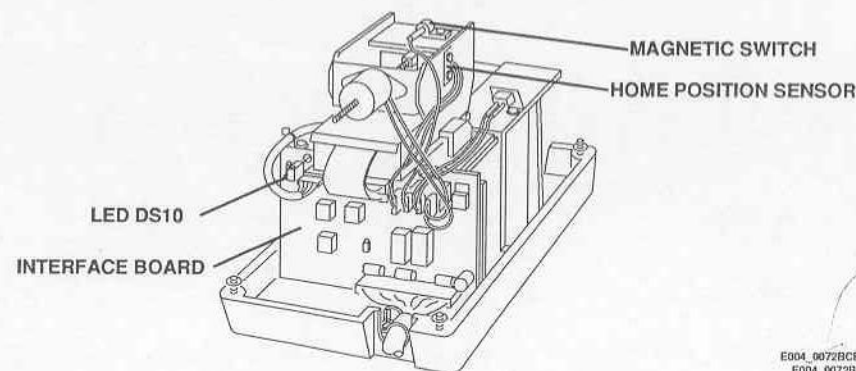
The HOME POSITION SENSOR sends a logic Hi signal of approximately +5 V dc to the computer. When the FLAG is not in the HOME SENSOR, the SENSOR sends a logic Lo signal of approximately 0 V to the computer. The software monitors the status of the HOME POSITION SENSOR only when the LINEAR ACTUATOR is driving the ELECTROMETER.



E004_0076BC

NOTE

LED DS10 on the INTERFACE BOARD is energized to indicate a logic Hi signal and deenergized to indicate a logic Lo signal.



E004_0072BCB
E004_0072BC

After the MAGNETIC SWITCH detects that the DTE PIPETTE was actuated, the computer in the DT60 ANALYZER sends a command signal to actuate the LINEAR ACTUATOR. When the LINEAR ACTUATOR starts, the FLAG is in the HOME POSITION SENSOR. The LINEAR ACTUATOR drives the ELECTROMETER more steps than necessary to move the CONTACTS to the SPOTTING STATION. The ELECTROMETER is

stopped mechanically in the correct position to read the slide before the command signal to the LINEAR ACTUATOR is removed.

After the offset, reference, and sample readings are completed, the LINEAR ACTUATOR reverses and drives the ELECTROMETER to the home-position. The software provides for more than the necessary steps to move the ELECTROMETER to the home-position. When the FLAG inserts into the HOME POSITION SENSOR and a logic Hi, or +5 V signal reaches the computer, the LINEAR ACTUATOR is stopped.

The software also monitors the LINEAR ACTUATOR for the number of steps from the SPOTTING STATION to the home-position. The software expects to detect a logic Hi signal from the HOME POSITION SENSOR within a given range of steps. If a logic Hi signal from the HOME POSITION SENSOR is detected before the LINEAR ACTUATOR has made the minimum number of steps, Error Code F20 is displayed in the LC DISPLAY.

Error Code F20 is also displayed if a logic Hi signal from the HOME POSITION SENSOR is not detected within the maximum number of expected steps. If the HOME POSITION SENSOR or the feedback circuit for the SENSOR has a malfunction, the LINEAR ACTUATOR might drive the ELECTROMETER for the maximum number of steps, and the FLAG might move through the home-position. If the LINEAR ACTUATOR is not stopped for the home-position, it stops at the maximum number of steps.

Tools and Materials:

MULTIMETER TL-3424

Possible Replacement Parts, DTE MODULE:

HOME POSITION SENSOR ASSEMBLY 350249

Type 1 INTERFACE CIRCUIT BOARD ASSEMBLY 617151, or

Type 2 INTERFACE CIRCUIT BOARD ASSEMBLY 351554

LINEAR ACTUATOR ASSEMBLY 617159

CABLE ASSEMBLY 617159

Possible Replacement Parts, DT60 ANALYZER:

For Multi-Board Configuration:

CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software

CIRCUIT BOARD ASSEMBLY 352520, for Version 10.7 Software and above

MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

For Both Configurations:

ADAPTER BOX ASSEMBLY 351572

Additional Information:

DTE MODULE

Adjustments and Special Procedures - HOME POSITION SENSOR

Diagrams - "Interconnect"

Parts/Removals

DT60 ANALYZER

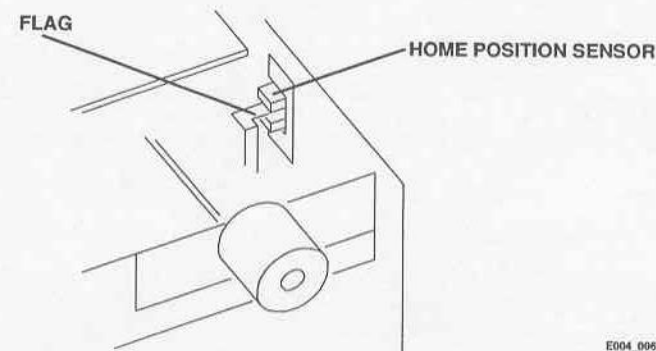
Adjustments and Special Procedures - POWER SUPPLY, Checkout

Diagrams

Parts/Removals

Specifications for the Adjustment of the HOME POSITION SENSOR:

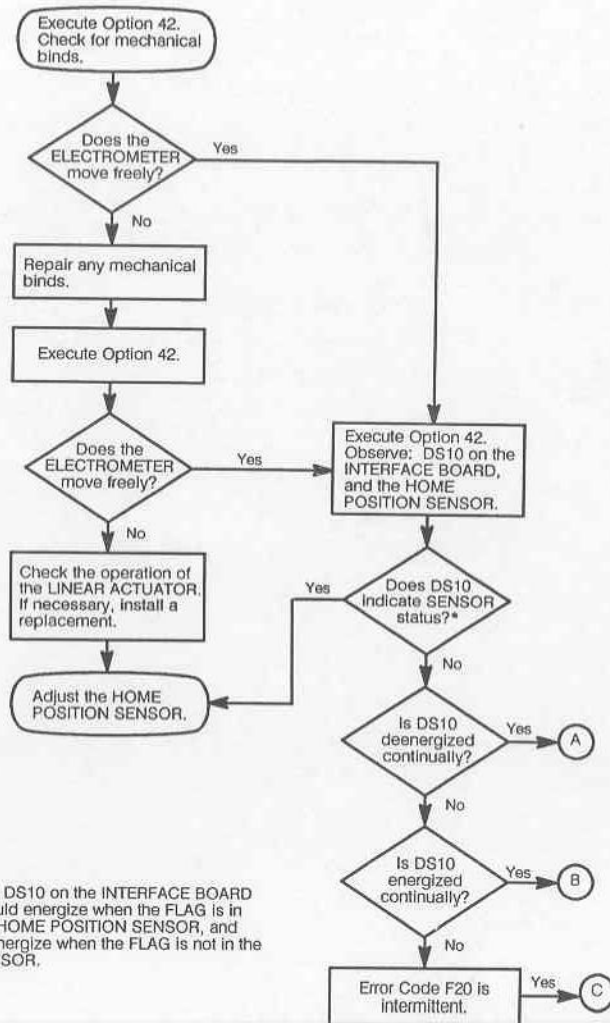
- The FLAG must enter the HOME POSITION SENSOR within the range of steps allowed by the software, and the NOSE ASSEMBLY must not obstruct the TIPS.
- Error Code F20 does not occur when Option 42 is executed for 2 cycles.



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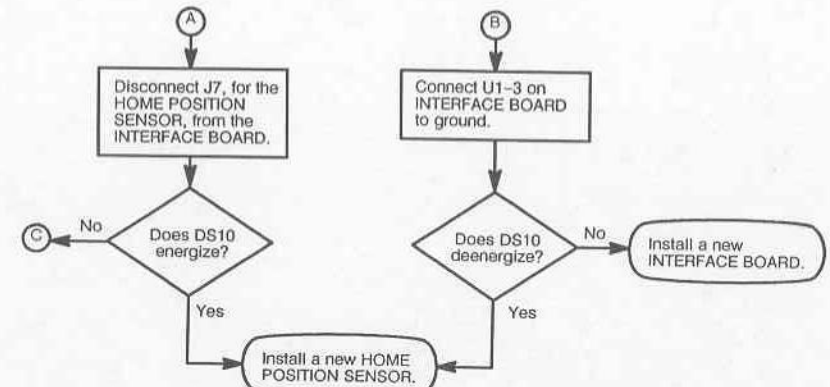
To check that the malfunction is repaired, use control fluid and process a potentiometric slide. If Error Code F20 does not occur, the diagnostic procedure is completed and the malfunction is repaired.

Error Code F20

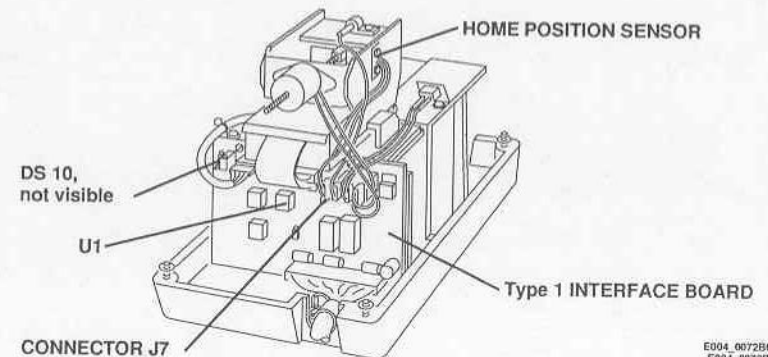


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Error Code F20 - Continued

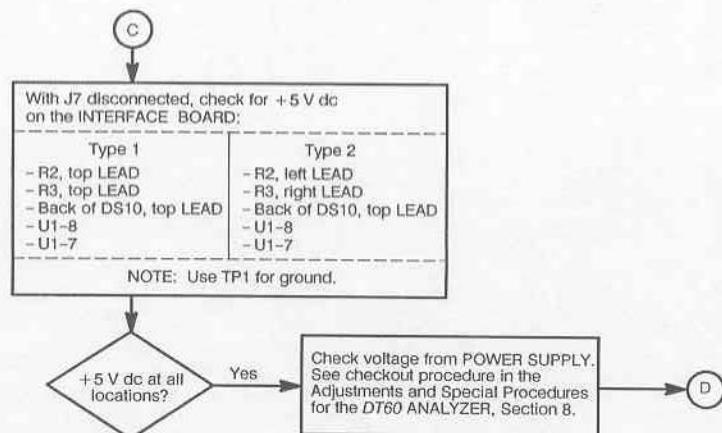


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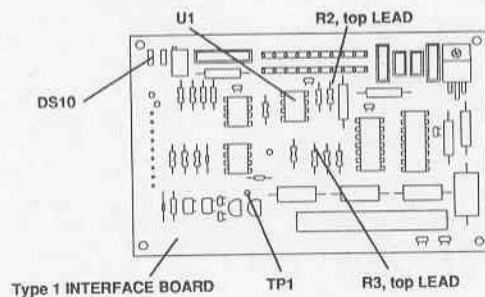


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E004_0072BCC

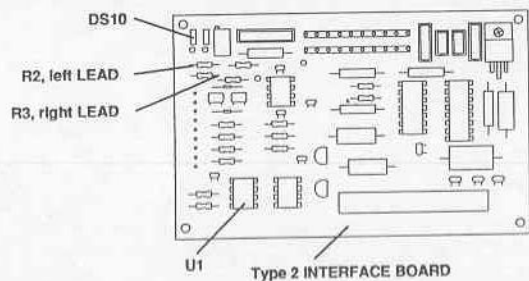
Error Code F20 – Continued



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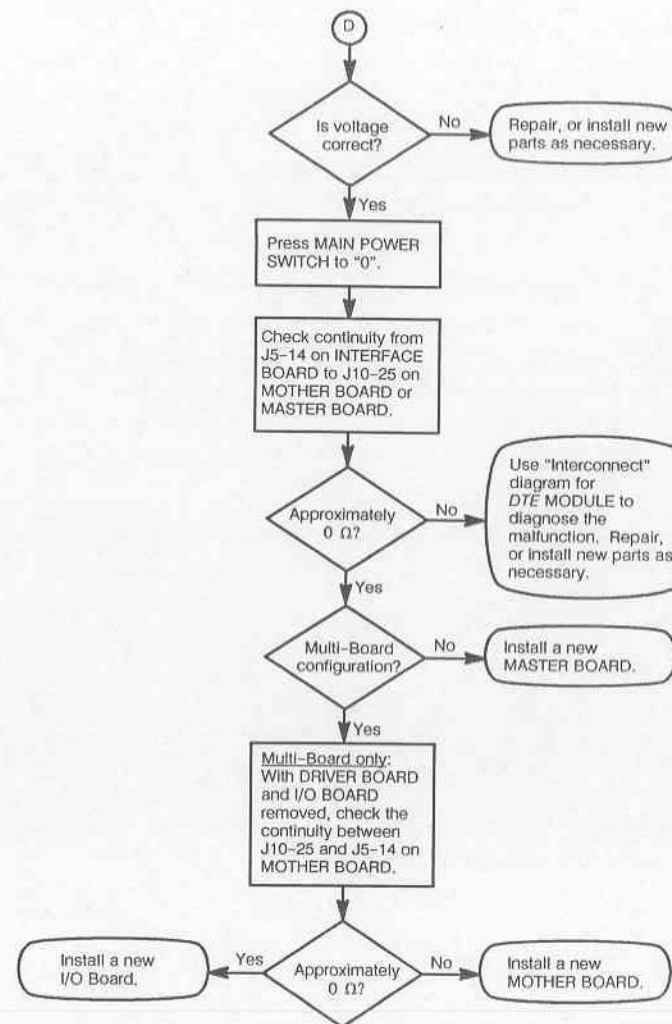


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XP3100-17

Error Code F20 – Continued



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XP3100-17

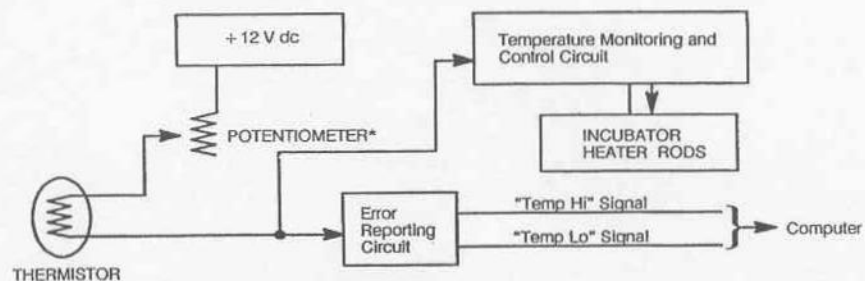
147

Error Code H11 — "TEMPERATURE MALFUNCTION"

DT60 ANALYZER

Description

Error Code H11 indicates a malfunction in the Error Reporting Circuit for the THERMISTOR in the DT60 ANALYZER.



* DRIVER BOARD, R58 in Multi-Board configuration
MASTER BOARD, R73 in Single Board configuration

E900_0186BS

Function and Normal Operation of the THERMISTOR

The THERMISTOR is installed in the INCUBATION CHAMBER and monitors the temperature in the INCUBATOR for 2 purposes. A voltage signal from the THERMISTOR to the HEATER ROD ASSEMBLY allows a Temperature Monitoring and Control Circuit to maintain the correct temperature in the INCUBATOR. The THERMISTOR also provides status signals to the computer about the temperature of the INCUBATOR.

+12 V dc is supplied to the THERMISTOR through POTENTIOMETER R58 on the DRIVER BOARD, or POTENTIOMETER R73 on the MASTER BOARD. The resistance in the THERMISTOR changes when the temperature changes.

- When the temperature **decreases**, the resistance in the THERMISTOR **increases** and the voltage from the THERMISTOR **decreases**.
- When the temperature **increases**, the resistance in the THERMISTOR **decreases** and the voltage from the THERMISTOR **increases**.

Temperature Monitoring and Control Circuit

The Temperature Monitoring and Control Circuit monitors the voltage from the THERMISTOR and compares that voltage with a reference voltage. A "Comparator" circuit on the DRIVER BOARD or the MASTER BOARD determines if the HEATER RODS should be energized to heat, or deenergized to cool the INCUBATOR.

NOTE

Error Code H11 does not indicate any malfunction of the HEATER RODS or the Temperature Monitoring and Control Circuit.

Error Reporting Circuit

The voltage output from the THERMISTOR is also monitored by a dual "Comparator" circuit in the Error Reporting Circuit. The dual Comparator circuit on the DRIVER BOARD or the MASTER BOARD sends 2 signals that are either Hi or Lo. In the circuit diagram on page 148 and in the diagram section of the service publication, the names of these signals are "Temp. Hi" and "Temp. Lo". The combination of the 2 signals indicates the temperature status of the INCUBATOR. The computer monitors the Error Reporting Circuit continually when power is applied to the DT60 ANALYZER.

NOTE

The Single-Board configuration does not have test points available for measuring the "Temp. Hi" or "Temp. Lo" signals in the Error Reporting Circuit.

In the Multi-Board Configuration, the "Temp. Lo" signal can be measured at TP10 on the DRIVER BOARD. The "Temp. Hi" signal can be measured at TP11. These signals change between logic Hi and logic Lo in combinations corresponding to the temperature limits that are set when the temperature of the INCUBATOR is adjusted. See the following table.

Error Reporting Circuit

Signals from Comparator Circuit			
"Temp. Lo", TP10	"Temp. Hi", TP11	Temperature Status	Message or Error Code
Lo	Lo	Within the limits set during temperature adjustment	"ANALYZER READY"
Lo	Hi	Too high	H12
Hi	Lo	Too low	H13
Hi	Hi	Circuit error	H11

NOTE

To measure the test points on the DRIVER BOARD, connect MULTIMETER TL-3424.
A Lo signal = approximately 0.1 V dc. A Hi signal = approximately 5.0 V dc.

MULTIMETER TL-3424	
—	+
TP1	TP10
TP1	TP11

If the temperature of the INCUBATOR is within the limits, both signals should be Lo. If both signals are not Lo, Status Code H14 is displayed in the LC DISPLAY and on the printout. After Status Code H14 occurs, the DT60 ANALYZER is automatically initialized. An Error Code H11, H12, or H13 is then displayed in the LC DISPLAY to provide additional information for diagnosing the malfunction.

Error Code H11 occurs when both signals are HI. This error indicates that the malfunction is in the Error Reporting Circuit and is not in the THERMISTOR, the HEATER RODS, or the Temperature Monitoring and Control Circuit.

Special Tools and Materials:

MULTIMETER TL-3424

Possible Replacement Parts

For Multi-Board Configuration:

DRIVER CIRCUIT BOARD ASSEMBLY 352387

I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software

I/O BOARD CIRCUIT ASSEMBLY 352520, for Version 10.7 Software and above

MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

Additional Information:

Diagrams - DT60 ANALYZER

"INTERCONNECT", figures 6 and 7

"DRIVER BOARD - Heater Circuit", figure 12

"I/O BOARD - V9.0 Software", figure 14b

"I/O BOARD - Version 10.7 and Version 11.0 Software", figure 15b

"MASTER BOARD - Interconnect", figures 22 and 24

Parts/Removals

Error Code H11

To Check for Correct Operation:

Initialize the DT60 ANALYZER again. If Error Code H11 does not occur, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
Multi-Board Configuration	
The DRIVER BOARD has a malfunction.	Determine the status of the Error Reporting Circuit. See the tables on page 149. - Use MULTIMETER TL-3424 and measure the voltage at TP10 and TP11 on the DRIVER BOARD. - If both signals are HI, or approximately 5.0 V dc, install a new DRIVER BOARD. - If the signals indicate another status, continue to diagnose the malfunction.
The MOTHER BOARD has a malfunction.	Check the continuity between the following pairs of locations: For Version 9.0 Software only TP10, DRIVER BOARD to U2, I/O BOARD TP11, DRIVER BOARD to U2, I/O BOARD For Versions 10.7/11.0 Software only TP10, DRIVER BOARD to U26, I/O BOARD TP11, DRIVER BOARD to U26, I/O BOARD For All Software Versions J4-52 to J6-52 on the MOTHER BOARD J4-53 to J6-53 on the MOTHER BOARD See the diagrams, "DRIVER BOARD - HEATER CIRCUIT" and "I/O BOARD - V9.0 Software". If the continuity is not correct, check the CONTACTS of CONNECTORS J4 and J6. Repair the CONTACTS as necessary, or install a new MOTHER BOARD. If continuity is detected between the DRIVER BOARD and the I/O BOARD, continue to diagnose the malfunction.
INTEGRATED CIRCUIT U2 or U26 on the I/O BOARD is not seated correctly.	For Version 9.0 Software: - Remove INTEGRATED CIRCUIT U2. Install it again and seat it correctly. For Versions 10.7 and 11.0 Software: - Remove INTEGRATED CIRCUIT U26. Install it again and seat it correctly.
INTEGRATED CIRCUIT U2 or U26 on the I/O BOARD has a malfunction.	Install a new I/O BOARD.
Single-Board Configuration	
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD.

Error Code H12 — "ANALYZER TEMP. HIGH"

DT60 ANALYZER

Description

Error Code H12 occurs when the computer detects a "too high" condition from the Error Reporting Circuit for the THERMISTOR in the DT60 ANALYZER. The "too high" condition might indicate either that the actual temperature of the INCUBATOR exceeds the adjusted high limit, or that the Error Reporting Circuit has a malfunction.

Temperature Control System for the INCUBATOR

A THERMISTOR is installed in the INCUBATION CHAMBER. The THERMISTOR monitors the temperature in the INCUBATOR for 2 purposes. A voltage signal from the THERMISTOR provides data to the computer about the temperature of the INCUBATOR. Another voltage signal from the THERMISTOR allows the Temperature Monitoring and Control Circuit to maintain the correct temperature in the INCUBATOR by energizing and deenergizing the HEATER RODS.

In Multi-Board units, a FAN starts when the DT60 ANALYZER is energized and operates continually to move air through the SPOTTING STATION, the INCUBATOR, and the READ STATION. In Single-Board units, the FAN starts when the temperature of the INCUBATOR reaches 0.5° C below the set point. The FAN has 3 functions:

- to remove heat from the electronic components,
- to provide balance for the heating and cooling cycle of the INCUBATOR, and
- to remove gases that occur during slide processing and remain in the area of the INCUBATOR.

NOTE

See the circuit diagram on page 154.

+12 V dc is supplied to the THERMISTOR through POTENTIOMETER R58 on the DRIVER BOARD, or POTENTIOMETER R73 on the MASTER BOARD. The resistance in the THERMISTOR changes when the temperature changes.

- When the temperature **decreases**, the resistance in the THERMISTOR **increases** and the voltage from the THERMISTOR **decreases**.
- When the temperature **increases**, the resistance in the THERMISTOR **decreases** and the voltage from the THERMISTOR **increases**.

Temperature Set Point and Limits

In the temperature adjustment for the INCUBATOR, rotation of POTENTIOMETER R58 or R73 establishes a "set point". The set point is the center of a voltage range for the normal operating temperature for slide processing. The computer allows a normal variation in temperature of ±0.3°C from the set point. If the set point is changed, the high and low temperature limits are also changed automatically.

Temperature Monitoring and Control Circuit

The Temperature Monitoring and Control Circuit monitors the voltage from the THERMISTOR and compares that voltage with a reference voltage. A "Comparator" circuit on the DRIVER BOARD or the MASTER BOARD determines if the HEATER RODS should be energized to heat, or deenergized to cool the INCUBATOR.

Error Reporting Circuit

The voltage output from the THERMISTOR is also monitored by a dual "Comparator" circuit in the Error Reporting Circuit. The dual Comparator circuit on the DRIVER BOARD or the MASTER BOARD sends 2 signals that are either Hi or Lo. In the circuit diagram on page 154 and in the diagram section of the service publication, the names of these signals are "Temp. Hi" and "Temp. Lo". The combination of the 2 signals indicates the temperature status of the INCUBATOR. The computer monitors the Error Reporting Circuit continually when power is applied to the DT60 ANALYZER.

NOTE

The Single-Board configuration does not have test points available for measuring the voltage of the 2 signals in the Error Reporting Circuit.

In the Multi-Board Configuration, the "Temp. Lo" signal can be measured at TP10 on the DRIVER BOARD. The "Temp. Hi" signal can be measured at TP11. These signals change between logic Hi and logic Lo in combinations corresponding to the temperature limits established when the temperature of the INCUBATOR is adjusted. See the following table.

Error Reporting Circuit

Signals from Comparator Circuit		Temperature Status	Message or Error Code
"Temp. Lo", TP10	"Temp. Hi", TP11		
Lo	Lo	Within the limits set during temperature adjustment	"ANALYZER READY"
Lo	Hi	Too high	H12
Hi	Lo	Too low	H13
Hi	Hi	Circuit error	H11

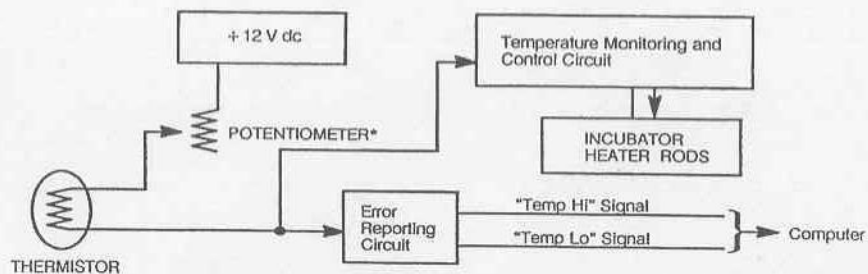
NOTE

To measure the test points on the DRIVER BOARD, connect MULTIMETER TL-3424. A Lo signal = approximately 0.1 V dc. A Hi signal = approximately 5.0 V dc.

MULTIMETER TL-3424	
—	+
TP1	TP10
TP1	TP11

If the temperature of the INCUBATOR is within the limits, both signals should be Lo. If both signals are not Lo, Status Code H14 is displayed in the LC DISPLAY and on the printout. After Status Code H14 occurs, the DT60 ANALYZER is automatically initialized. An Error Code H11, H12, or H13 is then displayed in the LC DISPLAY to provide additional information for diagnosing the malfunction.

If the temperature in the INCUBATOR exceeds the high limit, the "Temp. Lo" signal is Lo and the "Temp. Hi" signal is Hi. When the Error Reporting Circuit has the "too high" temperature status, Error Code H12 is displayed.



* DRIVER BOARD, R58 in Multi-Board configuration
MASTER BOARD, R73 in Single Board configuration

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Special Tools and Materials:

IMPORTANT

Do the checkout procedure for the TEMPERATURE PROBE TL-2598 before using the tool to measure temperature. See the Adjustments and Special Procedures, section 8 in this service manual.

TEMPERATURE PROBE TL-2598
THERMOMETER
MULTIMETER TL-3424
FORS EXTENDER BOARD TL-3340
LUBRICANT TL-3773

Possible Replacement Parts

For All Configurations

FAN ASSEMBLY 352536
THERMISTOR ASSEMBLY 343878

For Multi-Board Configuration:

DRIVER CIRCUIT BOARD ASSEMBLY 352387
I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software
I/O BOARD CIRCUIT ASSEMBLY 352520, for Version 10.7 Software and above
MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

Additional Information:

Adjustments and Special Procedures - DT60 ANALYZER

INCUBATOR — Temperature

POWER SUPPLY — Checkout

TEMPERATURE PROBE TL-2598 — Checkout

Diagrams - DT60 ANALYZER

"INTERCONNECT", figures 5, 6, and 7

"DRIVER BOARD - HEATER CIRCUIT", figure 12

"I/O BOARD - V9.0 Software", figure 14b

"I/O BOARD - Version 10.7 and Version 11.0 Software", figure 15b

"MASTER BOARD - INTERCONNECT", figures 22 and 24

Parts/Removals

Site Specifications - Kodak Ektachem DT SYSTEM

Error Code H12

To Check for Correct Operation:

Initialize the DT60 ANALYZER again and wait for the "ANALYZER READY" message in the LC DISPLAY. If Error Code H12 does not occur, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
After the temperature of the INCUBATOR was adjusted: - the DT60 ANALYZER was not initialized, or - not enough time was allowed for the INCUBATOR to reach the new temperature limits.	- If necessary, press the MAIN POWER SWITCH to the "0" position and wait until the INCUBATOR is cool. - Press the MAIN POWER SWITCH to the "1" position and allow the ANALYZER to initialize. If Error Code H12 does not occur again, no additional diagnosing is necessary.
The temperature in the room is too high.	- Use a THERMOMETER or the TEMPERATURE PROBE TL-2598 and check the temperature in the room. Compare the measured temperature with the temperature specifications in the Site Specifications section of the service publication. - If the room temperature is too high, provide that information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the DT60 ANALYZER.
The FAN has a malfunction or does not operate.	- Check for +12 V dc at CONNECTOR J11 on the MOTHER BOARD or the MASTER BOARD. CONNECTOR P11 for the FAN is connected at J11. - If the voltage is correct, install a new FAN. NOTE: In Multi-Board configuration, the FAN operates continually when the ANALYZER is energized. In Single-Board configuration, the FAN starts only during the heating cycle when the temperature is 0.5° C (0.2° F) below the set point.
The internal power in the DT60 ANALYZER is not within the specifications.	- Check for +12 V dc and 120 V dc at CONNECTOR J25 on the POWER SUPPLY. - If necessary, do the checkout procedure for the POWER SUPPLY. See the Adjustments and Special Procedures section for the DT60 ANALYZER. - Repair, or install replacement parts as necessary.
The THERMISTOR, the Temperature Monitoring and Control Circuit, or the Error Reporting Circuit has a malfunction.	Disconnect CONNECTOR J21 for the THERMISTOR and observe the LC DISPLAY. - If Error Code H12 changes to H11, advance to the "Error Reporting Circuit" section of this table. - If Error Code H12 changes to H13, advance to the "THERMISTOR or Temperature Monitoring and Control Circuit" section of this table.

Error Code H12 - Continued

Error Reporting Circuit

Possible Causes	Recommended Actions
Multi-Board Configuration	
The DRIVER BOARD has a malfunction.	Determine the status of the Error Reporting Circuit. See the tables on page 153. - With CONNECTOR J21 connected, use MULTIMETER TL-3424 and measure the voltage at TP10 and TP11 on the DRIVER BOARD. - If the voltage measurement for both TP10 and TP11 is Hi, or approximately 5.0 V dc, install a new DRIVER BOARD. - If the signals indicate another status, continue to diagnose the malfunction.
The MOTHER BOARD has a malfunction.	Check the continuity between the following pairs of locations: For Version 9.0 Software only TP10, DRIVER BOARD to U2, I/O BOARD TP11, DRIVER BOARD to U2, I/O BOARD For Versions 10.7/11.0 Software only TP10, DRIVER BOARD to U26, I/O BOARD TP11, DRIVER BOARD to U26, I/O BOARD For All Software Versions J4-52 to J6-52 on the MOTHER BOARD J4-53 to J6-53 on the MOTHER BOARD See the diagrams, "DRIVER BOARD - HEATER CIRCUIT" and "I/O BOARD - V9.0 Software". If the continuity is not correct, check the CONTACTS in CONNECTORS J4 and J6. Repair the CONTACTS as necessary, or install a new MOTHER BOARD. If continuity is detected between the DRIVER BOARD and the I/O BOARD, continue to diagnose the malfunction.
INTEGRATED CIRCUIT U2 or U26 on the I/O BOARD is not seated correctly.	For Version 9.0 Software: - Remove INTEGRATED CIRCUIT U2. Install it again and seat it correctly. For Versions 10.7 and 11.0 Software: - Remove INTEGRATED CIRCUIT U26. Install it again and seat it correctly.
INTEGRATED CIRCUIT U2 or U26 on the I/O BOARD has a malfunction.	Install a new I/O BOARD.
Single-Board Configuration	
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD.

Error Code H12 - Continued

To Check for Correct Operation:

Initialize the DT60 ANALYZER again and wait for the "ANALYZER READY" message in the LC DISPLAY. If Error Code H12 does not occur, the diagnostic procedure is completed and the malfunction is repaired.

THERMISTOR or Temperature Monitoring and Control Circuit

Possible Causes	Recommended Actions
The THERMISTOR has a malfunction.	<ul style="list-style-type: none">- With CONNECTOR J21 for the THERMISTOR disconnected, disconnect CONNECTOR J24 for the HEATER RODS.- Wait 5 minutes until the INCUBATOR is cool.- Use MULTIMETER TL-3424 and measure the resistance between PIN 1 and PIN 2 on CONNECTOR J21 for the THERMISTOR.- If the measured resistance is not approximately 9 KΩ, install a replacement for the THERMISTOR.
The Temperature Monitoring and Control Circuit has a malfunction.	<ul style="list-style-type: none">- If the measured resistance between PIN 1 and PIN 2 on CONNECTOR P21 is approximately 9 KΩ, install a replacement for the DRIVER BOARD or the MASTER BOARD. <p>IMPORTANT: Do the temperature adjustment for the INCUBATOR after installing a replacement part.</p>

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Error Code H13 — "ANALYZER TEMP. LOW"

DT60 ANALYZER

Description

Error Code H13 occurs when the computer detects a "too low" condition from the Error Reporting Circuit for the THERMISTOR in the DT60 ANALYZER. The "too low" condition might indicate either that the actual temperature of the INCUBATOR is less than the adjusted low limit, or that the Error Reporting Circuit has a malfunction.

IMPORTANT

An Error Code H13 is not displayed during the heating cycle for 45 minutes after initialization starts. After the 45 minutes, if the temperature is lower than the low temperature limit, then an Error Code H13 occurs.

Temperature Control System for the INCUBATOR

A THERMISTOR is installed in the INCUBATION CHAMBER. The THERMISTOR monitors the temperature in the INCUBATOR for 2 purposes. A voltage signal from the THERMISTOR provides data to the computer about the temperature of the INCUBATOR. Another voltage signal from the THERMISTOR allows the Temperature Monitoring and Control Circuit to maintain the correct temperature in the INCUBATOR by energizing and deenergizing the HEATER RODS.

In Multi-Board units, a FAN starts when the DT60 ANALYZER is energized and operates continually to move air through the SPOTTING STATION, the INCUBATOR, and the READ STATION. In Single-Board units, the FAN starts when the temperature of the INCUBATOR reaches 0.5° C below the set point. The FAN moves air from the room across the heated surfaces of the INCUBATOR and pulls ammonia gas from the slides.

NOTE

See the circuit diagram on page 162.

+12 V dc is supplied to the THERMISTOR through POTENTIOMETER R58 on the DRIVER BOARD, or POTENTIOMETER R73 on the MASTER BOARD. The resistance in the THERMISTOR changes when the temperature changes.

- When the temperature **decreases**, the resistance in the THERMISTOR **increases** and the voltage from the THERMISTOR **decreases**.
- When the temperature **increases**, the resistance in the THERMISTOR **decreases** and the voltage from the THERMISTOR **increases**.

Temperature Set Point and Limits

In the temperature adjustment for the INCUBATOR, rotation of the POTENTIOMETER establishes a "set point". The set point is in the center of a voltage range for the normal operating temperature for slide processing. The computer allows a normal variation in temperature of $\pm 0.3^{\circ}\text{C}$ from the set point. If the set point is changed, the high and low temperature limits are also changed automatically.

Temperature Monitoring and Control Circuit

The Temperature Monitoring and Control Circuit monitors the voltage from the THERMISTOR and compares that voltage with a reference voltage. A "Comparator" circuit on the DRIVER BOARD or the MASTER BOARD determines if the HEATER RODS should be energized to heat, or deenergized to cool the INCUBATOR.

Error Reporting Circuit

The voltage output from the THERMISTOR is also monitored by a dual "Comparator" circuit in the Error Reporting Circuit. The dual Comparator circuit on the DRIVER BOARD or the MASTER BOARD sends 2 signals that are either Hi or Lo. In the circuit diagram on page 162 and in the diagram section of the service publication, the names of these signals are "Temp. Hi" and "Temp. Lo". The combination of the 2 signals indicates the temperature status of the INCUBATOR. The computer monitors the Error Reporting Circuit continually when power is applied to the DT60 ANALYZER.

NOTE

The Single-Board configuration does not have test points available for measuring the "Temp. Hi" or "Temp. Lo" signals in the Error Reporting Circuit.

In the Multi-Board Configuration, the "Temp. Lo" signal can be measured at TP10 on the DRIVER BOARD. The "Temp. Hi" signal can be measured at TP11. These signals change between logic Hi and logic Lo in combinations corresponding to the temperature limits established when the temperature of the INCUBATOR is adjusted. See the following table.

Error Reporting Circuit

Signals from Comparator Circuit		Temperature Status	Message or Error Code
"Temp. Lo", TP10	"Temp. Hi", TP11		
Lo	Lo	Within the limits set during temperature adjustment	"ANALYZER READY"
Lo	Hi	Too high	H12
Hi	Lo	Too low	H13
Hi	Hi	Circuit error	H11

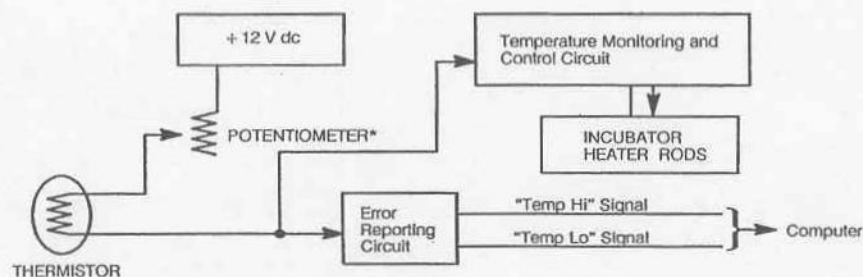
NOTE

To measure the test points on the DRIVER BOARD, connect MULTIMETER TL-3424. A Lo signal = approximately 0.1 V dc. A Hi signal = approximately 5.0 V dc.

MULTIMETER TL-3424	
—	+
TP1	TP10
TP1	TP11

If the temperature of the INCUBATOR is within the limits, both signals should be Lo. If both signals are not Lo, Status Code H14 is displayed in the LC DISPLAY and on the printout. After Status Code H14 occurs, the DT60 ANALYZER is automatically initialized. An Error Code H11, H12, or H13 is then displayed in the LC DISPLAY to provide additional information for diagnosing the malfunction.

If the temperature in the INCUBATOR is lower than the low limit, the "Temp. Lo" signal is Hi and the "Temp. Hi" signal is Lo. When the Error Reporting Circuit has the "too low" temperature status, Error Code H13 is displayed.



* DRIVER BOARD, R58 in Multi-Board configuration
MASTER BOARD, R73 in Single Board configuration

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Special Tools and Materials:

IMPORTANT

Do the checkout procedure for the TEMPERATURE PROBE TL-2598 before using the tool to measure temperature. See the Adjustments and Special Procedures, section 8 in this service manual.

TEMPERATURE PROBE TL-2598
THERMOMETER
MULTIMETER TL-3424
FORS EXTENDER BOARD TL-3340
LUBRICANT TL-3773

Possible Replacement Parts

For All Configurations

HEATER ROD ASSEMBLY 343881
THERMISTOR ASSEMBLY 343878

For Multi-Board Configuration:

DRIVER CIRCUIT BOARD ASSEMBLY 352387
I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software
I/O BOARD CIRCUIT ASSEMBLY 352520, for Version 10.7 Software and above
MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

Additional Information:

Adjustments and Special Procedures - DT60 ANALYZER

INCUBATOR — Temperature
POWER SUPPLY — Checkout
TEMPERATURE PROBE TL-2598 — Checkout

Diagrams - DT60 ANALYZER

"INTERCONNECT", figures 5, 6, and 7
"DRIVER BOARD - HEATER CIRCUIT", figure 12
"I/O BOARD - V9.0 Software", figure 14b
"I/O BOARD - Version 10.7 and Version 11.0 Software", figure 15b
"MASTER BOARD - INTERCONNECT", figures 22 and 24

Parts/Removals - DT60 ANALYZER

Site Specifications - Kodak Ektachem DT SYSTEM

Error Code H13

To Check for Correct Operation:

Initialize the DT60 ANALYZER again and wait for the "ANALYZER READY" message in the LC DISPLAY. If Error Code H13 does not occur, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
After the temperature of the INCUBATOR was adjusted: - the DT60 ANALYZER was not initialized, or - not enough time was allowed for the INCUBATOR to reach the new temperature limits.	- If necessary, initialize the DT60 ANALYZER and allow enough time for the INCUBATOR to reach the correct temperature. If "ANALYZER READY" is displayed on the LC DISPLAY after the initialization, and Error Code H13 does not occur again, no additional diagnosing is necessary.
The combination of the temperature and humidity in the room is not within the operating specifications of the DT60 ANALYZER.	- Use a THERMOMETER or the TEMPERATURE PROBE TL-2598 and check the temperature in the room. Compare the measured temperature with the temperature specifications in the Site Specifications section of the service publication. - If the room temperature is too low for the site specifications, provide that information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the DT60 ANALYZER.
The room has excessive air flow across the DT60 ANALYZER.	- Ask the customer to decrease the air flow. - If necessary, move the equipment to a location that does not have excessive air flow.
The internal power in the DT60 ANALYZER is not within the specifications.	- Check for +12 V dc and 120 V dc at CONNECTOR J25 on the POWER SUPPLY. - If necessary, do the checkout procedure for the POWER SUPPLY. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this manual. - Repair, or install replacement parts as necessary.
The THERMISTOR, the HEATER ROD ASSEMBLY, the Temperature Monitoring and Control Circuit, or the Error Reporting Circuit has a malfunction.	Measure and record the temperature of the INCUBATOR. Use the procedure in the temperature adjustment for the INCUBATOR. IMPORTANT: Do the checkout procedure for the TEMPERATURE PROBE TL-2598 before using the tool to measure the temperature of the INCUBATOR. - If the measured temperature of the INCUBATOR is within the specifications, advance to the "Error Reporting Circuit" section of this diagnostic. - If the measured temperature of the INCUBATOR is not within the specifications, advance to the "THERMISTOR, HEATER ROD ASSEMBLY or Temperature Monitoring and Control Circuit" section of this table.

Error Code H13 - Continued

Error Reporting Circuit

Possible Causes	Recommended Actions
Multi-Board Configuration	
The DRIVER BOARD has a malfunction.	Determine the status of the Error Reporting Circuit. See the tables on page 161. - With CONNECTOR J21 connected, use MULTIMETER TL-3424 and measure the voltage at TP10 and TP11 on the DRIVER BOARD. - If the voltage measurement for TP10 is Hi, or approximately 5.0 V dc, and TP11 is Lo, or approximately 0.1 V dc, install a new DRIVER BOARD. - If the signals indicate another status, continue to diagnose the malfunction.
The MOTHER BOARD has a malfunction.	Check the continuity between the following pairs of locations: For Version 9.0 Software only TP10, DRIVER BOARD to U2, I/O BOARD TP11, DRIVER BOARD to U2, I/O BOARD For Versions 10.7/11.0 Software only TP10, DRIVER BOARD to U26, I/O BOARD TP11, DRIVER BOARD to U26, I/O BOARD For All Software Versions J4-52 to J6-52 on the MOTHER BOARD J4-53 to J6-53 on the MOTHER BOARD See the diagrams, "DRIVER BOARD - HEATER CIRCUIT" and "I/O BOARD - V9.0 Software". If the continuity is not correct, check the CONTACTS in CONNECTORS J4 and J6. Repair the CONTACTS as necessary, or install a new MOTHER BOARD. If continuity is detected between the DRIVER BOARD and the I/O BOARD, continue to diagnose the malfunction.
INTEGRATED CIRCUIT U2 or U26 on the I/O BOARD is not seated correctly.	For Version 9.0 Software: - Remove INTEGRATED CIRCUIT U2. Install it again and seat it correctly. For Versions 10.7 and 11.0 Software: - Remove INTEGRATED CIRCUIT U26. Install it again and seat it correctly.
INTEGRATED CIRCUIT U2 or U26 on the I/O BOARD has a malfunction.	Install a new I/O BOARD.
Single-Board Configuration	
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD.

Error Code H13 - Continued

To Check for Correct Operation:

Initialize the DT60 ANALYZER again and wait for the "ANALYZER READY" message in the LC DISPLAY. If Error Code H13 does not occur, the diagnostic procedure is completed and the malfunction is repaired.

THERMISTOR, HEATER ROD ASSEMBLY, or Temperature Monitoring and Control Circuit

Possible Causes	Recommended Actions
The THERMISTOR has an open circuit or other malfunction.	<ul style="list-style-type: none"> - Disconnect CONNECTORS J21 and P21 for the THERMISTOR. - Use MULTIMETER TL-3424 and measure the resistance between PIN 1 and PIN 2 on CONNECTOR J21 for the THERMISTOR. - If the measured resistance is not approximately 9 K Ω, install a replacement for the THERMISTOR.
The HEATER ROD ASSEMBLY has a malfunction.	<ul style="list-style-type: none"> - Disconnect CONNECTORS P24 and J24 for the HEATER ROD ASSEMBLY. - Use MULTIMETER TL-3424 and measure the resistance between the following pairs of PINS on CONNECTOR P24: PIN 1 and PIN 2 PIN 3 and PIN 4 - If the measured resistance is not approximately 8 Ω in both locations, install a replacement for the HEATER ROD ASSEMBLY.
The Temperature Monitoring and Control Circuit has a malfunction.	<ul style="list-style-type: none"> - If the resistance measured on CONNECTOR P24 is not approximately 8 Ω, install a replacement for the DRIVER BOARD or the MASTER BOARD. <p>IMPORTANT: Do the temperature adjustment for the INCUBATOR after installing a replacement part.</p>

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Error Code H14 — "ANALYZER TEMPERATURE OUT"

DT60 ANALYZER

Description

IMPORTANT

Do not use "H14" as a Purpose Code for SCAN.

Error Code H14 is a status message that indicates any malfunction in the Error Reporting Circuit and the Temperature Monitoring and Control Circuit for the DT60 ANALYZER. After Error Code H14, the DT60 ANALYZER initializes, and an Error Code H11, H12, or H13 will be displayed on the LC DISPLAY.

The DT60 ANALYZER is not able to detect the actual temperature in the INCUBATOR. Service personnel must use TEMPERATURE PROBE TL-2598 to obtain an approximate temperature. The temperature adjustment for the INCUBATOR adjusts the voltage in the Temperature Monitoring and Control Circuit after the high and low temperatures are measured for 3 heating cycles. Average high and low temperatures are calculated, and the POTENTIOMETER is rotated to increase or decrease the voltage. The adjustment causes a corresponding change in the temperature within the INCUBATOR.

An Error Code H13 occurs when the DT60 ANALYZER indicates that the temperature is too low for normal operation after the 45-minute heating cycle. During the temperature adjustment for the INCUBATOR, the voltage "set point" is changed. The upper and lower voltage error limits adjust with the set point. During the first initialization of the DT60 ANALYZER after the temperature adjustment is completed, the new temperature of the INCUBATOR might not be within the old software limits.

After the temperature of the INCUBATOR is adjusted, the DT60 ANALYZER should be initialized more than once until the initialization can be completed without Error Codes H14 and H13. If Error Codes H14 and H13 are displayed on the LC DISPLAY during initialization, start the initialization again. If the error codes continue to occur after the ANALYZER is initialized more than once, do the diagnostic procedure for the given error code.

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Error Code H15 — "TEMPERATURE MALFUNCTION"

DTE MODULE

Description

Error Code H15 indicates that a malfunction is detected in the temperature control system in the DTE MODULE. Many different conditions can cause this error code.

The following components operate together to control and monitor the temperature in the DTE MODULE.

TEMPERATURE CONTROL MODULE, including:

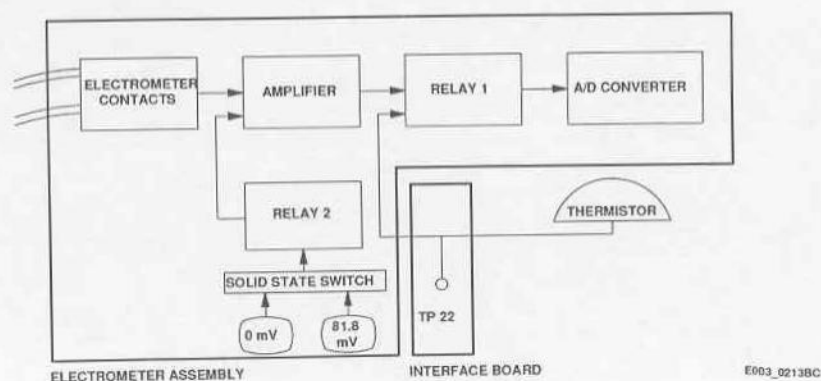
- THERMISTOR
- HEAT PUMP
- HEAT SINK

HEAT PUMP CIRCUIT BOARD

FAN

ELECTROMETER ASSEMBLY

The ELECTROMETER is the main component in this system. A RELAY allows the ELECTROMETER to alternate between reading the slides and providing the correct temperature for the slides. See the following block diagram of the ELECTROMETER.



RELAY 1 can connect either of 2 signals to the A/D CONVERTER. For temperature control, RELAY 1 selects the signal from the THERMISTOR. When the THERMISTOR is selected, the SLIDE CONTACTS, through the AMPLIFIER, are disconnected from the A/D CONVERTER. The A/D CONVERTER receives only the voltage from the THERMISTOR. Voltage from the THERMISTOR can be measured at TP22 on the INTERFACE BOARD.

When the THERMISTOR is connected to the A/D CONVERTER through RELAY 1, the computer applies the limits in the software to check the temperature. The computer allows RELAY 1 to select temperature control and monitoring only when the MAGNETIC SWITCH detects metering or when Option 44 is executed.

Option 44

Option 44 can be used to check the temperature control and monitoring system after Error Code H15 occurs. Option 44 has 3 cycles that operate the HEAT PUMP and the FAN. The signal from the A/D CONVERTER is monitored during Option 44 for expected changes. When Option 44 is executed, the message "DTE MODULE TEMP TEST" is displayed on the LC DISPLAY.

Option 44 — Cycle 1, the Heating Mode

First, the computer sends a command signal to operate the HEAT PUMP in the heating mode for 10 seconds. The software checks the A/D units from the A/D CONVERTER before and after the HEAT PUMP is actuated. The A/D units must increase by 30 or more units. DS7 on the DRIVER BOARD, or DS2 on the MASTER BOARD in the DT60 ANALYZER will be illuminated.

For example, using the conversion factor of $1.1489 \text{ mV} = 1 \text{ A/D unit}$, the voltage from the THERMISTOR should increase by 34.5 mV or more.

$$30 \text{ A/D units} \times 1.1489 \text{ mV/unit} = 34.5 \text{ mV}$$

If the system is operating correctly, the A/D CONVERTER can detect a result that is approximately 240 to 300 A/D units.

Option 44 — Cycle 2, the Cooling Mode

If the heating operation of the Option 44 test is successful, the computer sends a command signal to cause the HEAT PUMP to operate in the cooling mode for 20 seconds. At the same time, the FAN is also actuated. The software again checks the signal from the A/D CONVERTER and expects the value to decrease by 30 or more A/D units. DS6 on the DRIVER BOARD, or DS3 on the MASTER BOARD will be illuminated.

In the cooling mode, the HEAT PUMP transfers the heat from the INCUBATOR to the HEAT SINK on the HEAT PUMP ASSEMBLY. The FAN operates only during the cooling cycle to cool the FINS on the HEAT SINK.

Option 44 — Cycle 3, the Heating Mode Is Repeated

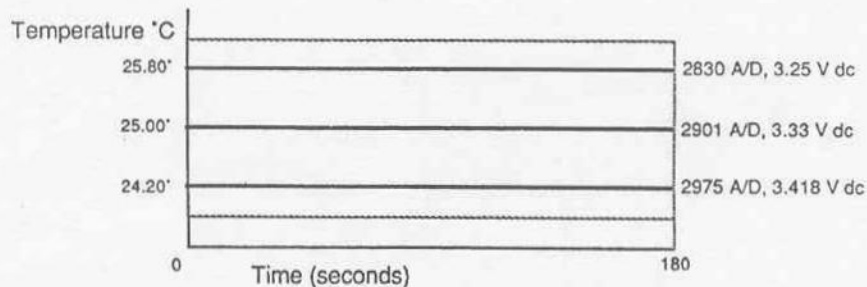
In cycle 3, the computer sends a command signal to operate the HEAT PUMP for an additional 10 seconds. DS7 on the DRIVER BOARD, or DS2 on the MASTER BOARD will be illuminated.

If the checkouts in Option 44 have correct results, "OK" is displayed with "DTE MODULE TEMP TEST" on the LC DISPLAY to indicate that the test is successful. If either the heating mode or the cooling mode is not successful, or if both modes are not successful, "FAIL" and Error Code H15 are displayed. The error could be caused by a malfunction of any component in the temperature system.

Normal Temperature Control In the DTE MODULE

Temperature control and monitoring during normal operation is more complex than the operation of Option 44. The following description includes an example of the possible operation of the temperature control system when slides are processed in sequence.

The purpose of the system is to obtain a temperature range of 24.20° to 25.80° C (75.5° to 78.5° F) in the INCUBATOR before the ELECTROMETER reads the slide, and to keep the INCUBATOR within that range until the reading is completed. The DTE MODULE has a "set point" of 25.00° C (77.0° F) that cannot be adjusted. The following figure indicates the set point and the high and low temperature limits.



E999_01628S

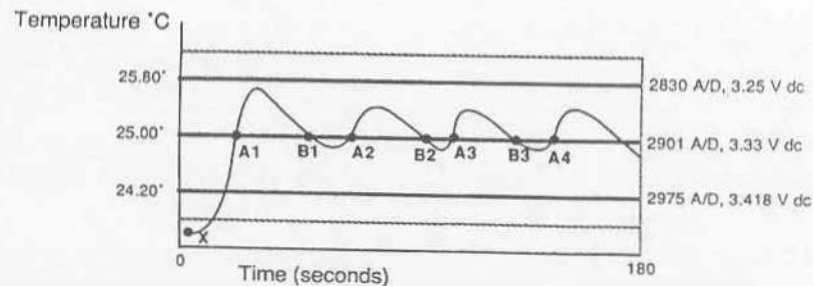
NOTE

A/D units and the voltage from the THERMISTOR are indicated in the figure. A/D units are displayed on the printout as "TEMP" when a slide is processed and when Option 14 is entered. The voltage can be measured at TP22 on the INTERFACE BOARD. If the temperature remains within these limits during the slide incubation, no heating or cooling will occur.

In the graphic example on page 173, the temperature at the site is less than 24° C (75° F). Metering occurs at point "X" when the temperature of the INCUBATOR is approximately the same as the site temperature. The computer detects that the voltage reading from the THERMISTOR is less than 3.418 V dc (2975 A/D units). The computer then sends a command signal through the HEAT PUMP BOARD to actuate the HEAT PUMP in the heating mode.

The HEAT PUMP provides heat until the temperature reaches 25.00° C (3.333 V dc, 2901 A/D units). See point "A1" on the figure. The HEAT PUMP is actuated in the cooling mode at point A1, but thermal inertia causes the temperature to continue to increase above 25.00° C. Then the temperature decreases. When the computer detects less than 2901 A/D units, at point "B1" on the figure, the HEAT PUMP is changed to the heating mode again. Thermal inertia allows the temperature to continue to decrease temporarily, but then the heating occurs again until 25.00° C is reached again at point "A2".

These cycles continue during the 180 seconds in the incubation operation. Note that the first peak is larger than the following peaks, because the HEAT PUMP is energized for more time during the first cycle than during the other cycles.

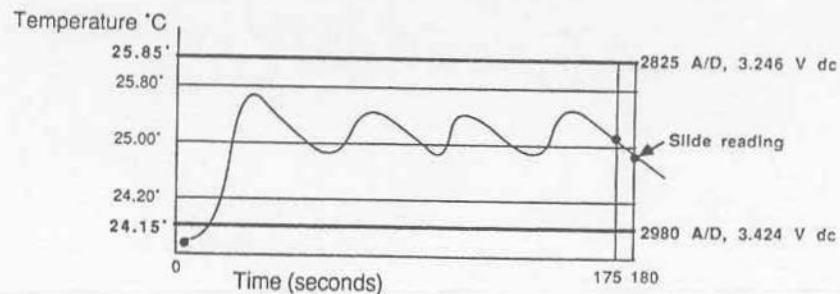


E999_01808S

Function of Error Code H15

After 175 seconds of the heating cycle, the computer checks the A/D signal from the ELECTROMETER to determine if the value is within the error limits of 24.20° to 25.80° C, or 2975 to 2830 A/D units. It is important to understand that Error Code H15 is displayed only if the computer checkout at 175 seconds determines a temperature error. If the temperature is within the error limits at 175 seconds, no error occurs.

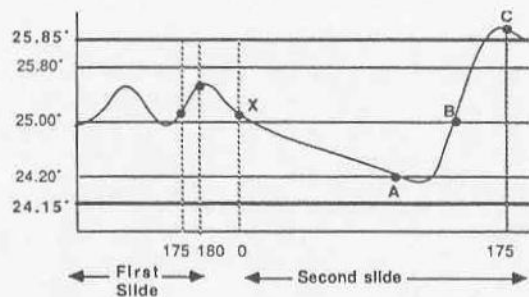
The temperature might be within the limits during the first 174 seconds, but if the temperature changes at 175 seconds and the reading exceeds the limits, Error Code H15 is displayed. See the following graphic example of this condition.



E999_01818S

If no error is detected when the computer checks the A/D signal at 180 seconds, RELAY 1 disconnects the THERMISTOR from the A/D CONVERTER and connects the ELECTROMETER CONTACTS to the A/D CONVERTER. Then the ELECTROMETER makes the reference, offset, and slide readings to process a result. The temperature control system is not connected again until the computer detects a signal from the MAGNETIC SWITCH to indicate that metering has occurred.

Error Code H15 might occur when no malfunction has occurred. This condition could be caused by the software control characteristics in all software versions. If the first slide is processed when the room temperature is approximately 22° C (72° F), and the next slide is processed immediately, the false Error Code H15 could occur. See the following figure.



E999_017985

After the reading for Slide 1, the software disconnects the temperature control system and the temperature decreases. Then Slide 2 is inserted and metering occurs at point "X". The software does not energize the HEAT PUMP until the low temperature limit is reached, at point "A". At point A the software actuates the HEAT PUMP in the heating mode, and the temperature increases. At point "B", the software actuates the HEAT PUMP in the cooling mode, but thermal inertia causes the temperature to continue to increase. The first heating peak at point "C" is the largest, because the HEAT PUMP is energized for a longer time. If the computer checkout of the A/D signal at 175 seconds occurs at the same time as a first temperature peak that exceeds the high limit, Error Code H15 will occur. To diagnose this error, check for the following equipment malfunctions.

- The THERMISTOR is not in tight contact with the metal, or not enough THERMAL COMPOUND is applied to fill all air spaces.
- An excessive quantity of THERMAL COMPOUND is applied to the THERMISTOR.
- The HEAT PUMP ASSEMBLY is not in direct contact with the surface of the INCUBATOR.
- The room has excessive air flow, or a room temperature of approximately 20.0° C (72.0° F).

Special Tools and Materials:

THERMOMETER
MULTIMETER TL-3424

Possible Replacement Parts

For All Configurations

FAN ASSEMBLY 617161
TEMPERATURE CONTROL MODULE 618322
HEAT PUMP CIRCUIT BOARD ASSEMBLY 617156
Type 1 ELECTROMETER BOX ASSEMBLY 351800
Type 2 ELECTROMETER BOX ASSEMBLY 352649
INTERFACE CIRCUIT BOARD ASSEMBLY 351554

For Multi-Board Configuration:

DRIVER CIRCUIT BOARD ASSEMBLY 352387
I/O CIRCUIT BOARD ASSEMBLY 343937, for Version 9.0 Software
I/O BOARD CIRCUIT ASSEMBLY 352520, for Version 10.7 Software and above
MOTHER BOARD ASSEMBLY 352495

For Single-Board Configuration:

MASTER BOARD ASSEMBLY 352655

Additional Information:

Diagrams - DTE MODULE

"INTERCONNECT", figure 1
"HEAT PUMP CIRCUIT BOARD ASSEMBLY", figure 2
"INTERFACE CIRCUIT BOARD ASSEMBLY", figures 3a and 3b
"ELECTROMETER CIRCUIT BOARD ASSEMBLY", figure 4

Diagrams - DT60 ANALYZER

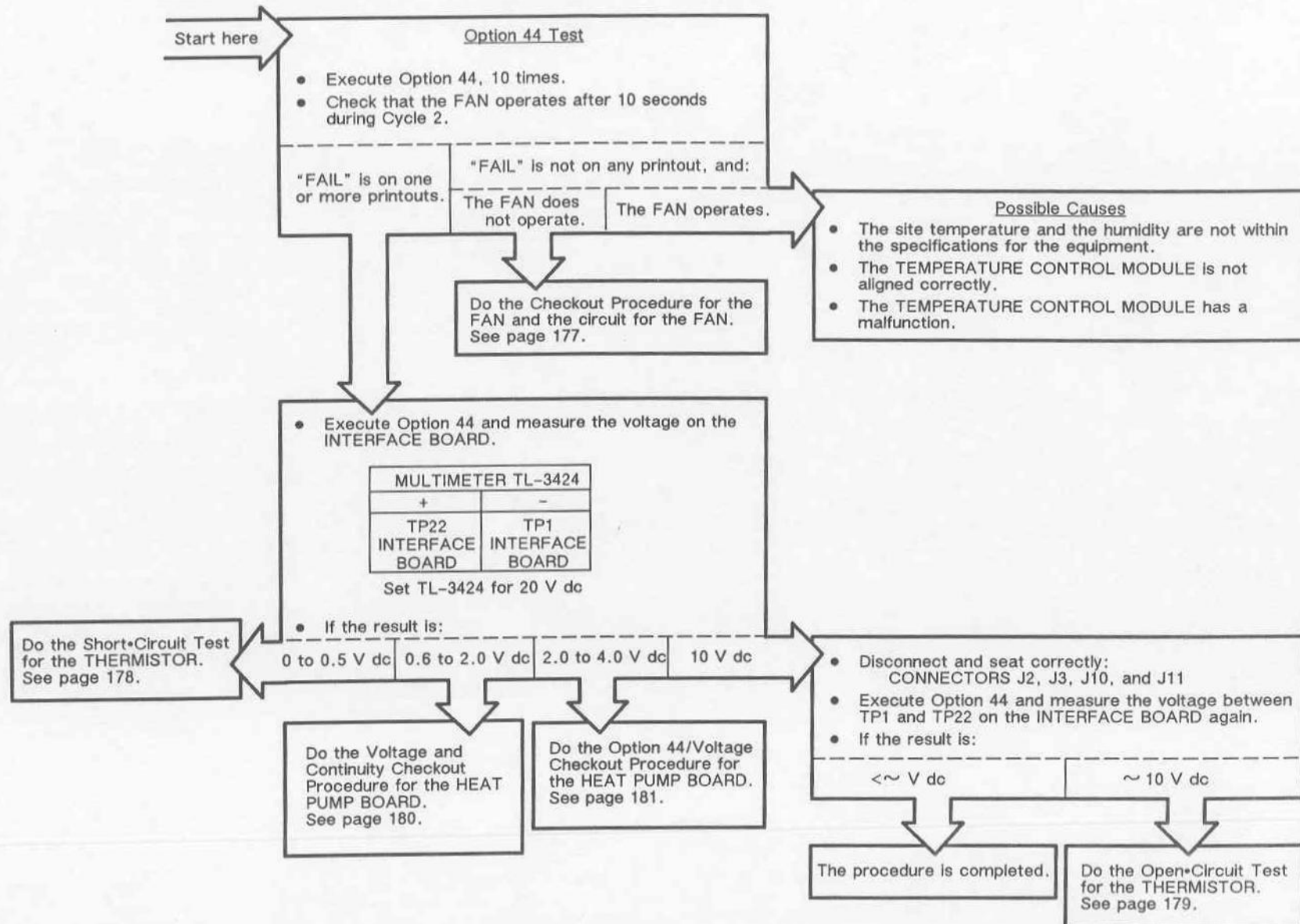
"Interconnect - FORS ASSEMBLY, INCUBATOR, HEAT PUMP for DTE MODULE", figure 6
"DRIVER BOARD - HEAT CONTROL PUMP for DTE MODULE", figure 9
"I/O BOARD - Version 9.0 Software", figures 14a and 14b
"I/O BOARD - Version 10.7 and Version 11.0 Software", figures 15a and 15b
"MASTER BOARD - INTERCONNECT", figures 22 and 24

Parts/Removals - DT60 ANALYZER

Parts/Removals - DTE MODULE

Site Specifications - Kodak Ektachem DT SYSTEM

Diagnostic for Error Code H15



Diagnostic for Error Code H15 – Continued

Checkout Procedure for the FAN

- Measure the voltage across CR10 on the HEAT PUMP BOARD.
- Continue to measure the voltage and execute Option 44.
- Observe the voltage when LED "DS6" is energized on the DRIVER BOARD or on the MASTER BOARD.
- If the result is:

Voltage did not change from 0 V dc to +12 V dc.

Voltage changed from 0 V dc to +12 V dc.

- Check the condition of CONNECTOR J12 on the FAN ASSEMBLY.
- If necessary, install a new FAN ASSEMBLY in the DTE MODULE.

- Measure the voltage:

MULTIMETER TL-3424	
+	-
Q7-2, on the HEAT PUMP BOARD.	TP1 on the INTERFACE BOARD.

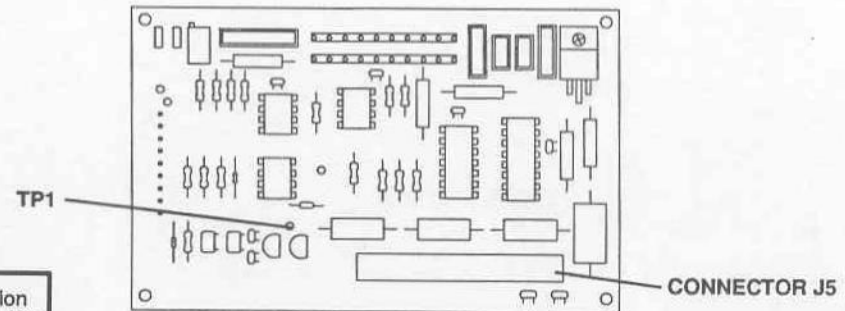
- Continue to measure the voltage and execute Option 44.
- Observe the voltage when LED "DS6" is energized on the DRIVER BOARD or on the MASTER BOARD.
- If the result is:

Voltage did not change from ≈ 0 V dc to ≈ 1.0 V dc.

Voltage changed from ≈ 0 V dc to 1.0 V dc.

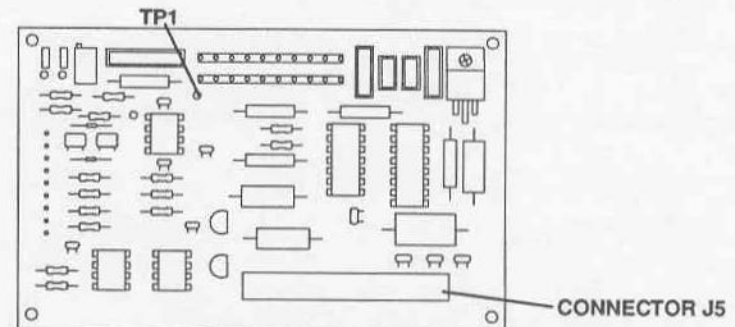
Install a replacement for the HEAT PUMP BOARD.

- Check the continuity:
 - from CONNECTOR J5-25 on the INTERFACE BOARD to CONNECTOR J10-44 on the INTERFACE CABLE.
 - from CONNECTOR J10-44 to CONNECTOR J3-7 on the MOTHER BOARD, if the ANALYZER is a Multi-Board Configuration.
- If necessary, replace the I/O BOARD or the MASTER BOARD.
- If Error Code H15 occurs again, a replacement for the INTERFACE BOARD might be necessary.



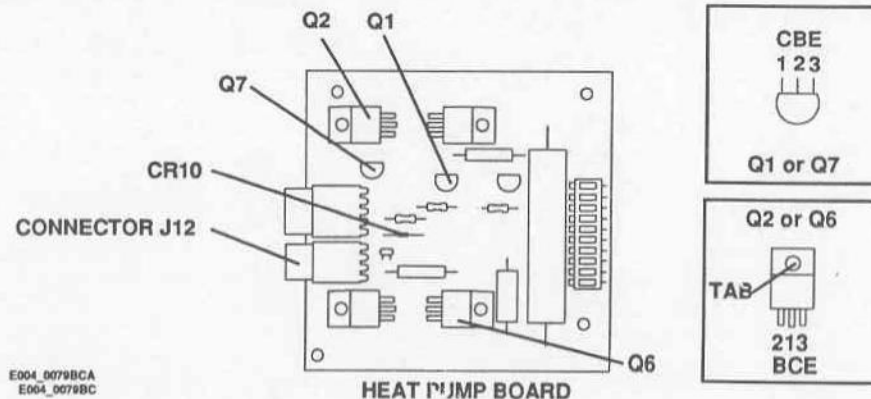
Type 1 INTERFACE BOARD

E004_0078BCB
E004_0078BC



Type 2 INTERFACE BOARD

E004_0077BCB
E004_0077BC

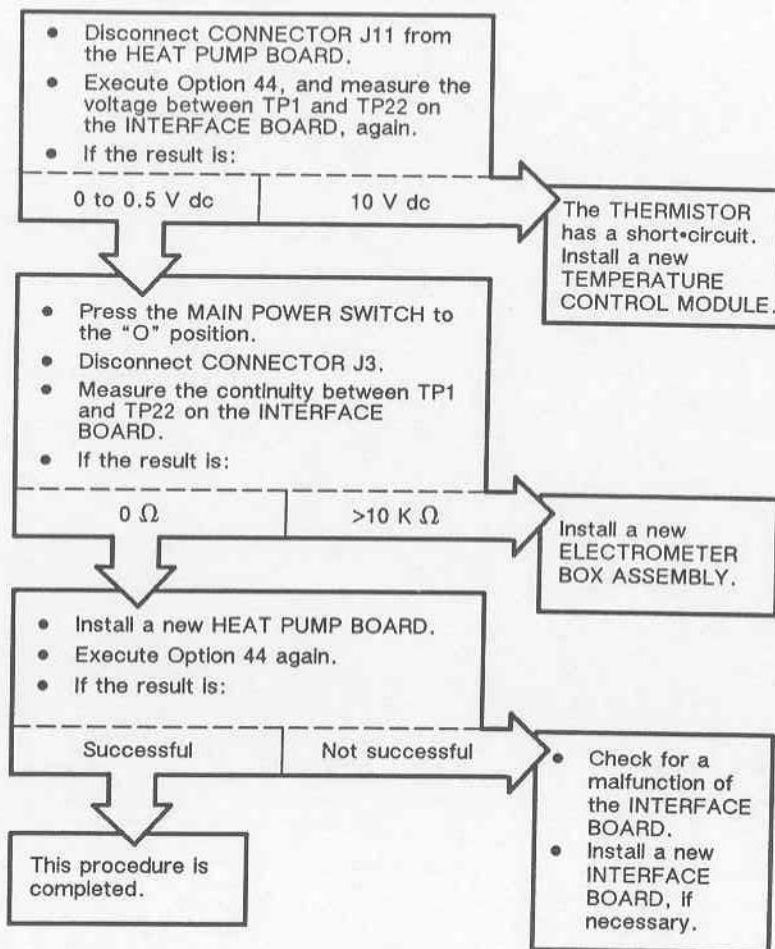


E004_0079BCA
E004_0079BC

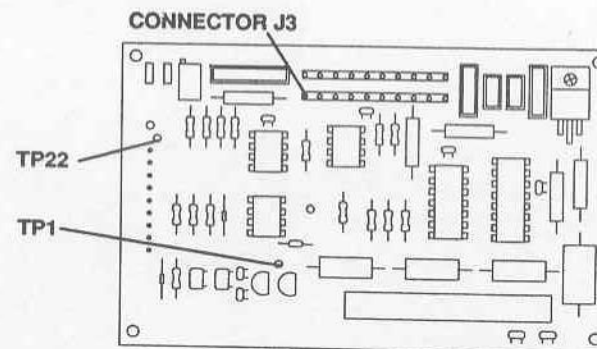
K91046jk-5

Diagnostic for Error Code H15 – Continued

Short-Circuit Test for the THERMISTOR

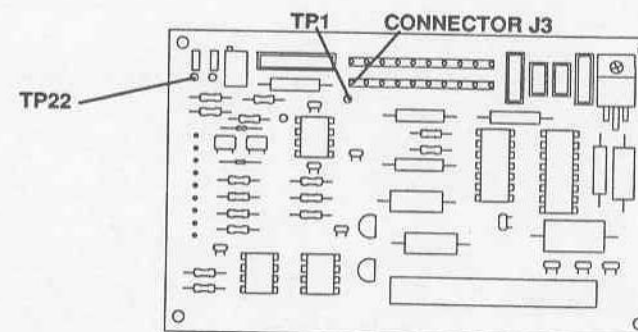


K91046jk-3



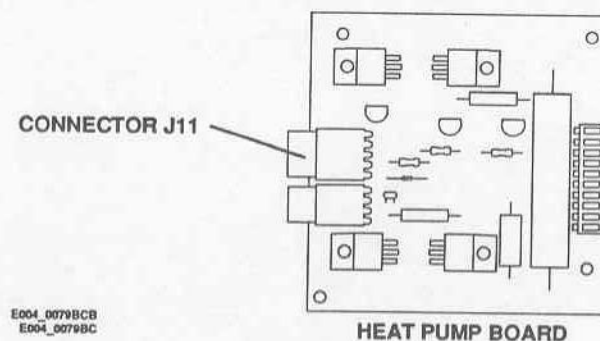
Type 1 INTERFACE BOARD

E004_0078BCC
E004_0078BC



Type 2 INTERFACE BOARD

E004_0077BCC
E004_0077BC



E004_0079BCB
E004_0079BC

HEAT PUMP BOARD

Diagnostic for Error Code H15 – Continued

Open-Circuit Test for the THERMISTOR

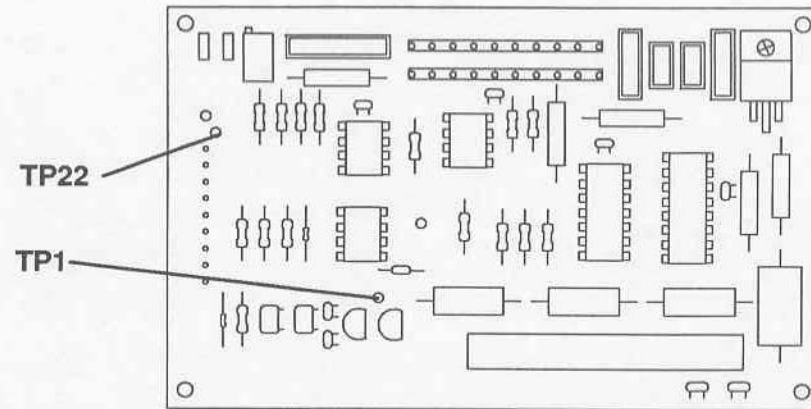
- Press the MAIN POWER SWITCH to the "0" position.
- Disconnect CONNECTOR J11 from the HEAT PUMP BOARD.
- Measure the impedance of the THERMISTOR between P11-1 and P11-2. A normal result should be $\approx 100\text{ K } \Omega$.
- If the result is:

<100 K Ω

>100 K Ω

- The THERMISTOR has an open-circuit.
Check the continuity:
– from P11-2 to TP22
– from P11-1 to TP1
- Diagnose and repair any open-circuit. See the Diagrams section for the DTE MODULE.

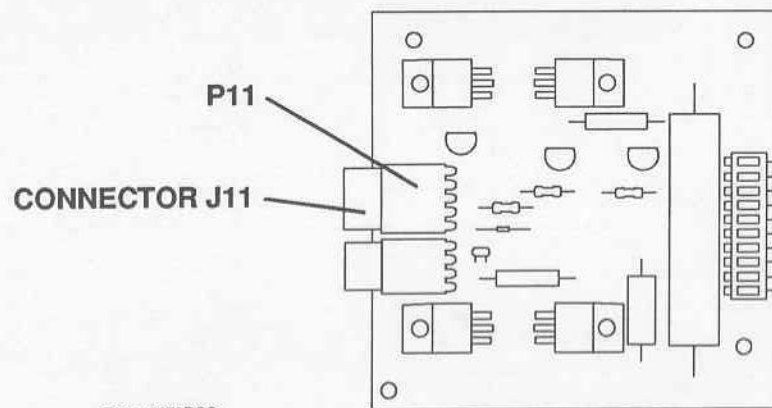
- The THERMISTOR has a malfunction.
Install a new TEMPERATURE CONTROL MODULE.
- Execute Option 44 again.



Type 1 INTERFACE BOARD

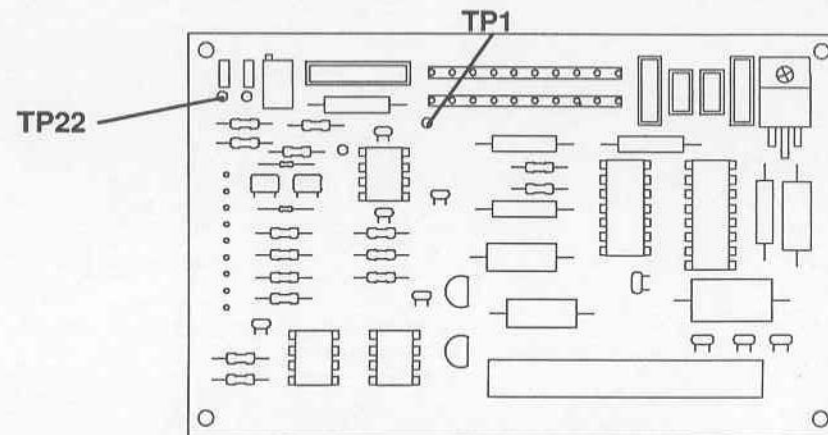
E004_0078BCD
E004_0078BC

K91046jk-4



HEAT PUMP BOARD

E004_0079BCC
E004_0079BC

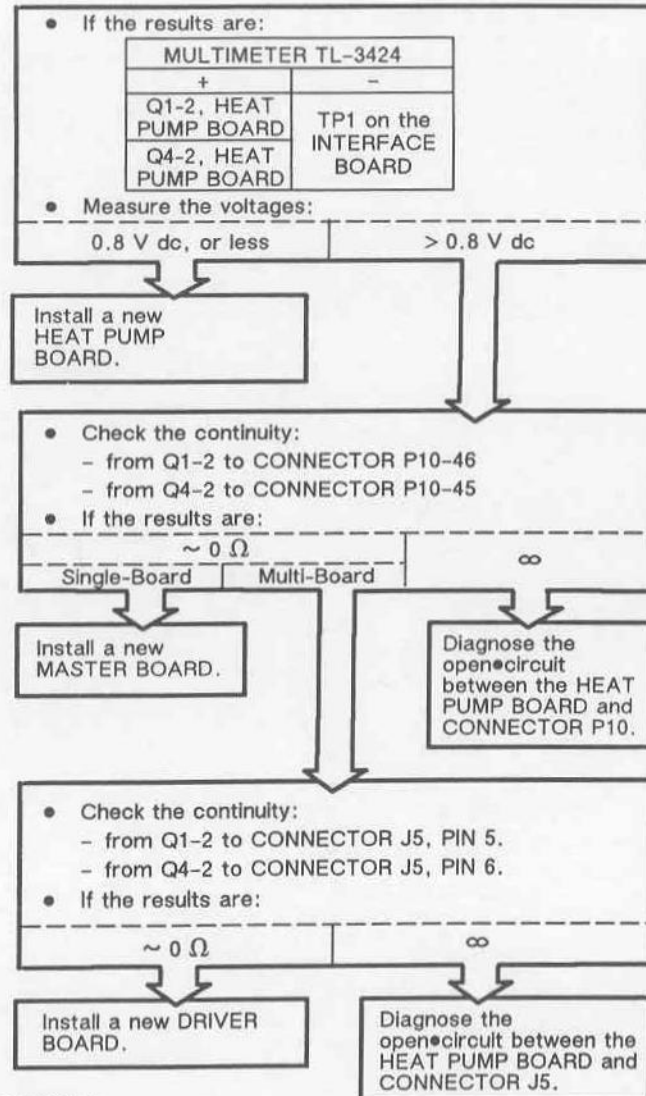


Type 2 INTERFACE BOARD

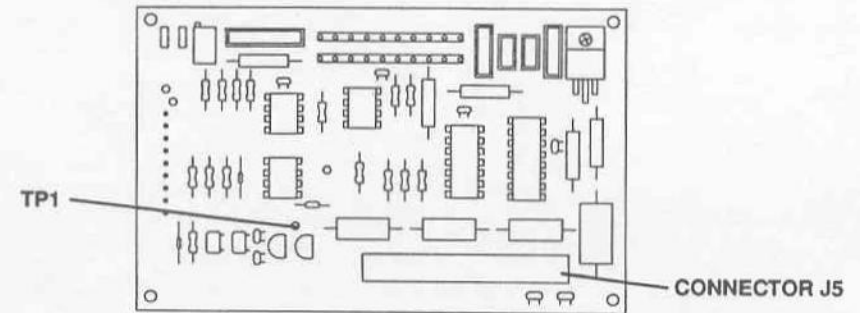
E004_0077BCD
E004_0077BC

Diagnostic for Error Code H15 – Continued

Voltage and Continuity Checkout Procedure for the HEAT PUMP BOARD

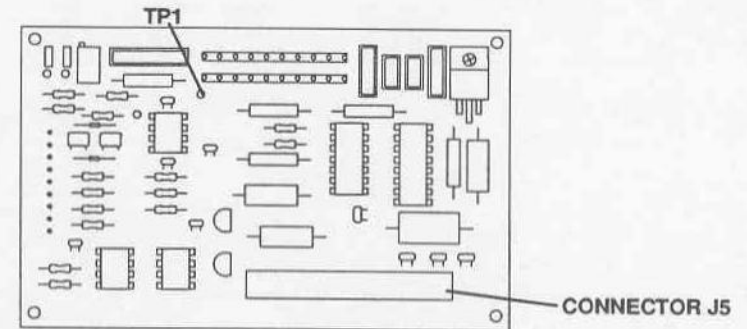


k90a006ml



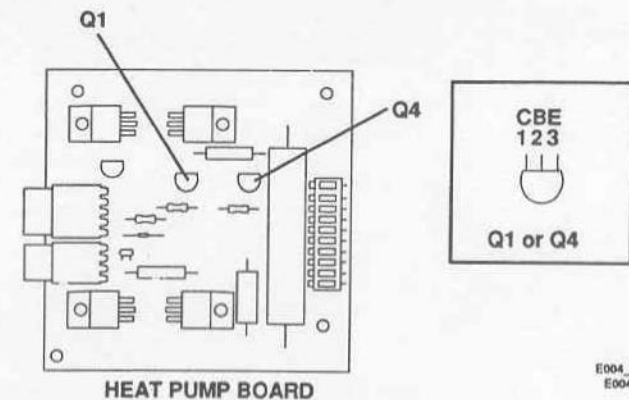
Type 1 INTERFACE BOARD

E004_0078BCB
E004_0078BC



Type 2 INTERFACE BOARD

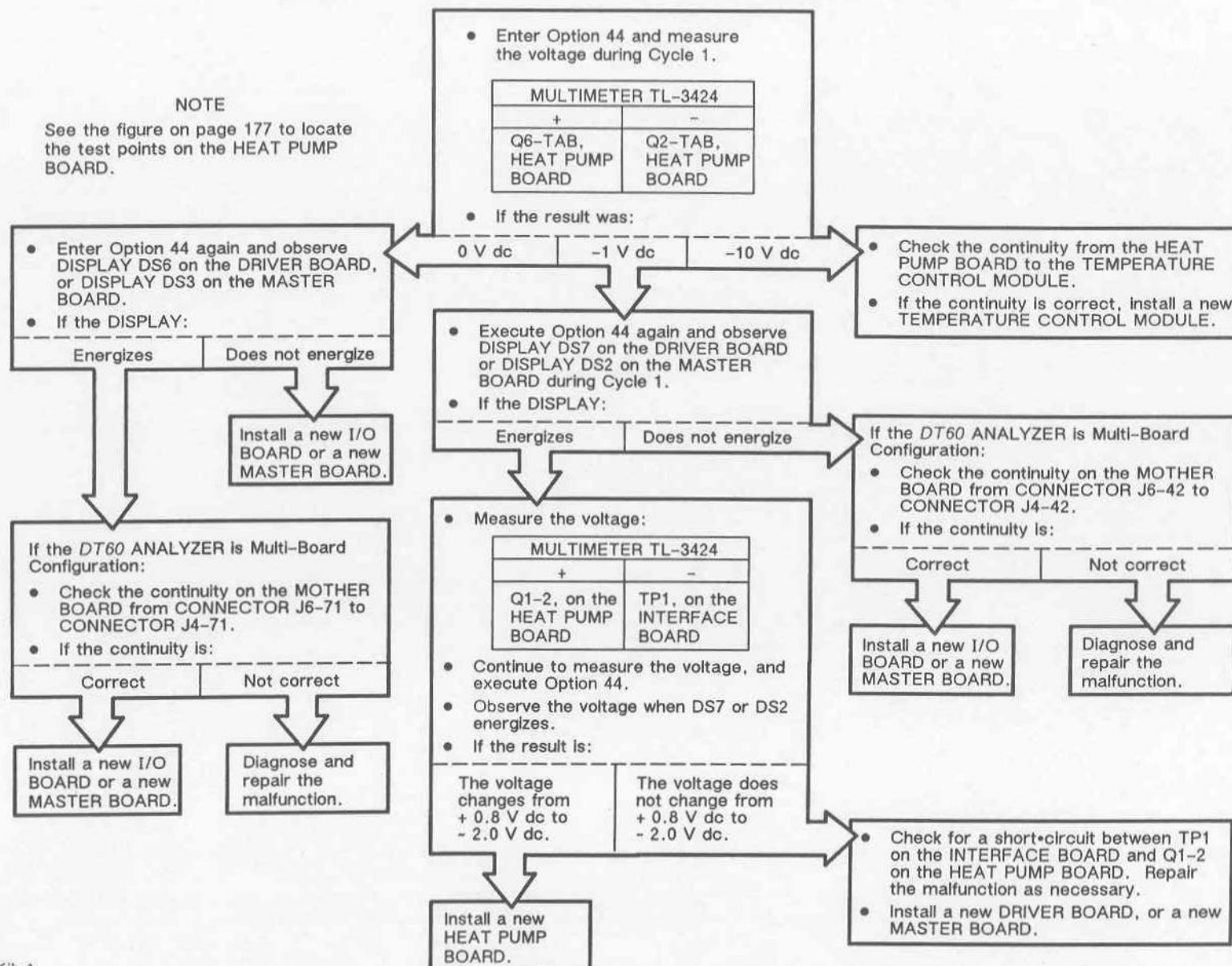
E004_0077BCB
E004_0077BC



E004_0079BCD
E004_0079BC

Diagnostic for Error Code H15 – Continued

Option 44/Voltage Checkout Procedure for the HEAT PUMP BOARD



K9I046jk-1

Error Codes R11, R12, R13, R14, R15, R16, and R17 — "RESULTS INVALID"

Description

Error Codes R11 to R15 indicate fluctuations in the readings and the electronics of the FORS ASSEMBLY. Each code indicates a different condition of the FORS ASSEMBLY, but the diagnostic procedure is the same for all 5 error codes.

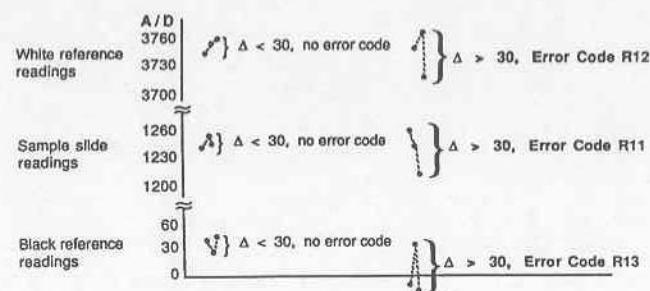
Error Codes R16 and R17 indicate that the reference readings are not within the expected range. The same diagnostic procedure is used as for Error Codes R11 to R15, but Error Codes R16 and R17 each have an additional diagnostic table.

Error Codes R11, R12, and R13

R11, R12, and R13 indicate that the sample reading, the white reference reading, or the black reference reading is not stable. During the normal slide processing operation of the DT60 ANALYZER, the FORS ASSEMBLY first makes a reading of the WHITE REFERENCE TARGET on the bottom surface of the LOWER RACK. This reading establishes the white reference value for the calculation of the test result. Next, the DT60 ANALYZER makes a sample reading of the slide. Finally, a reading is made with all LEDs in the FORS ASSEMBLY deenergized. The last reading determines the black reference or "offset" value to be used in the test calculation.

Each of these readings is an average of 3 rapid consecutive exposures that occur within milliseconds of each other. To check that the optics and the electronics in the FORS ASSEMBLY are stable, the A/D results for these 3 exposures are compared by the computer. If the 3 exposures for a reading are not within 30 A/D units of each other, an error code will be displayed on the printout. No test results are displayed if an error code occurs.

- If the 3 exposures of the slide are not within the limits, Error Code R11 occurs.
- If the 3 exposures of the WHITE REFERENCE TARGET are not within the limits, Error Code R12 occurs.
- If the 3 black reference exposures are not within the limits, Error Code R13 occurs.



E999_0183BS

Error Code R14

Error Code R14 indicates that the maximum limit for all readings made by the FORS ASSEMBLY was exceeded. This high limit is 4100 A/D units. Erratic fluctuations in the electronics of the FORS ASSEMBLY could cause the limit to be exceeded. Error Code R14 might also occur if the A/D CONVERTER is busy. Error Code R14 is displayed on the printout, and no test results are displayed.

Error Code R15

Since the white reference and black reference readings provide the upper and lower limits for the readings made by the FORS ASSEMBLY, the value for a sample reading would normally be between the values for the 2 reference readings. Erratic fluctuations in the electronics of the FORS ASSEMBLY could cause the sample reading to be higher than the high limit or lower than the low limit. If the value of the sample reading is not between the values of the black reference and white reference readings, Error Code R15 is displayed on the printout, and no test results are displayed.

IMPORTANT

To diagnose and repair the causes of Error Codes R16 and R17, use the diagnostic tables for Error Codes R11 to R15. Then check the additional conditions included in the diagnostic tables for Error Code R16 and Error Code R17.

Error Code R16

During slide processing, when the DT60 ANALYZER makes a reading of the WHITE REFERENCE TARGET, the computer expects the white reference value to be within a range of 3400 to 4000 A/D units. If the white reference reading is not within the expected range, Error Code R16 is displayed on the printout. No additional readings are made and no test results are displayed. The test must be processed again.

Error Code R17

During slide processing, when the DT60 ANALYZER makes a black reference reading, the computer expects the black reference value to be within a range of -100 to +100 A/D units. If the black reference reading is not within the expected range, Error Code R17 is displayed on the printout. No additional readings are made and no test results are displayed. The test must be processed again.

Special Tools:

MULTIMETER TL-3424
FORS ADJUSTMENT BOARD TL-3340

Possible Replacement Parts

FORS ASSEMBLY 352473
FORS WEIGHT ASSEMBLY 352696
LOWER RACK ASSEMBLY 352543
LOWER RACK ASSEMBLY 352434, Modification No. 6

Additional Information:

Adjustments and Special Procedures — DT60 ANALYZER

- FORS ASSEMBLY — Illumination
- HOME SENSOR/LOWER RACK — Alignment
- UPPER RACK — Alignment
- LOWER ARM — Alignment
- UPPER ARM — Height
- POWER SUPPLY — Checkout Procedure

Parts and Removals — DT60 ANALYZER

Specifications for the Adjustment of the HOME SENSOR and LOWER RACK:

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at step +86, and
- move down off the TRAILING EDGE of the slide at step +87, +88, or +89.

Specifications for the Adjustment of the UPPER RACK:

Execute Option 68 for -59 steps, and measure 0.152 to 1.54 mm (0.005 to 0.023 in.) between the PUSHER FINGER and the INCUBATOR.

Specifications for the Adjustment of the LOWER ARM:

- When the UPPER RACK is in the home-position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance, and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

Specifications for the Height Adjustment of the UPPER ARM:

When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

NOTE

For a Type 1 PRESSURE PAD, the step count is 20.

For a Type 2 PRESSURE PAD, the step count is 70.

With the RACKS in the home-position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

Specifications for the Illumination Adjustment of the FORS ASSEMBLY:

For White Reference, check for A/D values of 3650 to 3850. If the correct values are not obtained, adjust the A/D values to 3690 to 3850. Each group of 5 values must be within 10 A/D units of each other.

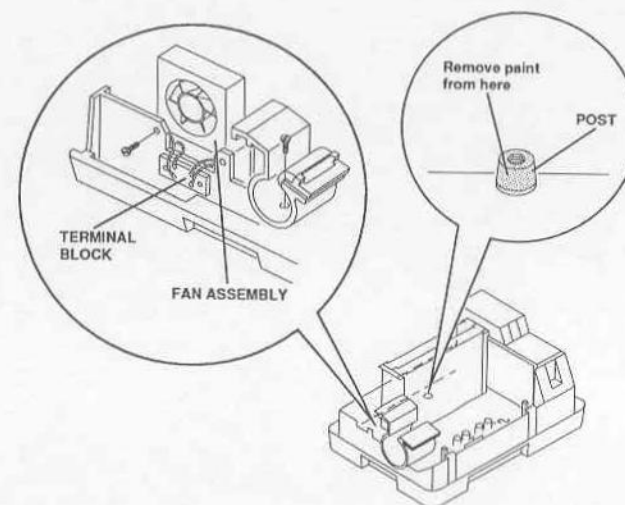
For Black Reference, the A/D values must be -100 to +100. Each group of 5 values must be within 10 A/D units of each other.

Error Codes R11, R12, R13, R14, and R15

To Check for Correct Operation:

Initialize the DT60 ANALYZER and start processing tests. If the error code does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- The ground connection for the FORS ASSEMBLY is not correct.- The REGULATORS on the FORS BOARD have fluctuations.	<p>To check for a ground loop in the FORS ASSEMBLY, connect the FORS ADJUSTMENT BOARD TL-3340 and:</p> <ul style="list-style-type: none">- Check that the dc resistance between TP12 on TL-3340 and the TERMINAL BLOCK on the FAN ASSEMBLY is $< 1 \Omega$. See the figure on page 185.- Check that the dc resistance between TP12 and the ground location on the MOTHER BOARD or the MASTER BOARD is $< 1 \Omega$. <p>NOTE: In Multi-Board configuration, the ground location is TP1 on the MOTHER BOARD. In Single-Board configuration, the ground location is TP10 on the MASTER BOARD.</p> <p>If the dc resistance is $> 1 \Omega$, remove the conductive paint from the POSTS that hold the MOTHER BOARD or the MASTER BOARD onto the CHASSIS. See the figure on the bottom of this page.</p>



ED03 91040CA
ED03 9304DC

Error Codes R11, R12, R13, R14, and R15 - Continued

To Check for Correct Operation:

Initialize the DT60 ANALYZER and start processing tests. If the error code does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
CONNECTOR J13 from the FORS ASSEMBLY to the MOTHER BOARD or the MASTER BOARD is loosened.	Seat CONNECTOR J13 correctly.
The power distribution system is erratic.	Do the checkout procedure for the POWER SUPPLY. See Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in the service manual.
The earth ground at the customer site is not correct. IMPORTANT: Correct earth ground is very important to the correct operation of the FORS ASSEMBLY.	<ul style="list-style-type: none"> - Check that the ground for the ac input power is correct. See the Site Specifications for the Kodak Ektachem DT SYSTEM, section 12 in the service manual. - If necessary, speak to the customer about the recommended site specifications. The customer is expected to provide site conditions that are within the operating specifications for the equipment.
<ul style="list-style-type: none"> - The FORS WEIGHT ASSEMBLY does not press the slide down on the FORS HEAD correctly. - Vibration of the slide in the READ STATION causes erratic readings. 	Install a new style FORS WEIGHT ASSEMBLY. The new style FORS WEIGHT ASSEMBLY has a PLATE installed to cover the wires. See Parts and Removals for the DT60 ANALYZER, section 10 in the service manual.
The FORS ASSEMBLY is damaged.	Obtain information from TAC in the Customer Support Center in Rochester. Installation of a replacement for the FORS ASSEMBLY might be necessary.

Error Codes R16 and R17

To Check for Correct Operation:

Initialize the DT60 ANALYZER and start processing tests. If the error code does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

IMPORTANT

To diagnose and repair the causes of Error Code R16 and R17, use the diagnostic tables for Error Codes R11 to R15. Then check the additional conditions included in the following diagnostic tables.

Possible Causes	Recommended Actions
Error Code R16	
POTENTIOMETER R26 is set to provide a gain that is > 4.31 V dc.	Do the adjustment procedure for the FORS ASSEMBLY. See Adjustments and Special Procedures, section 8 in the service manual.
The FORS HEAD is dirty.	Clean the FORS HEAD.
The WHITE REFERENCE TARGET is dirty, damaged, or removed from the bottom surface of the LOWER RACK.	<ul style="list-style-type: none"> - Deenergize the DT60 ANALYZER. - Move the LOWER RACK to the eject position. - Check the condition of the WHITE REFERENCE TARGET. - If the TARGET is dirty or is removed from the LOWER RACK, install a replacement for the LOWER RACK ASSEMBLY. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual. <p>IMPORTANT: If a replacement for the LOWER RACK is installed, do the following adjustments and procedures in the given sequence:</p> <p>HOME SENSOR/LOWER RACK UPPER RACK UPPER ARM LOWER ARM Dr Procedure*</p> <p>IMPORTANT: *If the Dr values are not within the given limits, do:</p> <p>Correction Factors procedure Full calibration for all chemistries used by the customer.</p>
Error Code R17	
In older DT60 ANALYZERS, the FORS BOARD has 5 POTENTIOMETERS. The additional POTENTIOMETER, R25, sets the null voltage. If POTENTIOMETER R25 is not set correctly, the black reference readings might exceed the limits.	Do the illumination adjustment for the FORS ASSEMBLY. See Adjustments and Special Procedures, section 8 in the service manual.

Error Code R18 — "PROTOCOL ERROR"

Description

Error Code R18 protects the results of NH_3 /CREA tests from "ammonia carryover" caused by BUN tests. The BUN slides produce ammonia when they are processed. If the results of a BUN test are > 40 mg/dL, the gas from the BUN slide might change the results of a following NH_3 /CREA test. If an operator starts to process a NH_3 or CREA slide after processing a BUN slide with a result that is > 40 mg/dL, Error Code R18 is displayed on the printout. No test results are completed or displayed.

Error Code R18 is a status message to the operator. No mechanical malfunction can cause this error code. Diagnosis and repair by the FE are not necessary.

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Error Message — Colorimetric "SLIDE NOT IDENTIFIED"

Description

When a slide is inserted, the BAR CODE READER detects the reflection from the white slide surface. The computer recognizes that a slide has been loaded into the SPOTTING STATION.

Next, the computer expects to receive data to identify the slide as colorimetric. The BAR CODE on each slide has 3 lines that indicate the type of slide.

Finally, the Slide Identification System expects to detect the chemistry and the Generation No. If the Slide Identification System recognizes the 3 lines for a slide, but cannot decode the sections of the BAR CODE that identify the chemistry and the Generation No., the message "SLIDE NOT IDENTIFIED" is displayed in the LC DISPLAY.

Special Tools:

MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Possible Replacement Parts

BAR CODE READER 350246
CDM

Additional Information

Operator's Manual for the *Kodak Ektachem DT60* ANALYZER

Normal Operation — *DT60* ANALYZER, section 2 in the service manual

"Slide Identification System"

Adjustments and Special Procedures — *DT60* ANALYZER

BAR CODE READER — Multi-Board Configuration

BAR CODE READER — Single-Board Configuration

IMPORTANT

The height adjustment for the TIP SEAT must be checked after the PIPETTE LOCATOR COVER is removed and installed.

Adjustments and Special Procedures — *DTE* MODULE

- BAR CODE READER — Voltage

Specifications for the *DT60* ANALYZER

BAR CODE READER — Multi-Board Configuration

- Connect:

MULTIMETER TL-3424	
+	-
DRIVER BOARD, TP5	MOTHER BOARD, TP1

- Insert the BAR CODE SLIDE TL-3482 with the white side up.
- If the TAB on the BAR CODE READER is toward the left of the ANALYZER, the voltage should be -5.25 to -5.75 V dc.
- If the TAB on the BAR CODE READER is toward the front or the back of the ANALYZER, the voltage should be -4.25 to -4.75 V dc.
- If necessary, rotate POTENTIOMETER R47 on the DRIVER BOARD

BAR CODE READER — Single Board Configuration

- Connect:

MULTIMETER TL-3424	
+	-
MASTER BOARD, TP14	MASTER BOARD, TP1

- Use the white surface and the black surface of BAR CODE SLIDE TL-3482. Insert the tool slide.
- The voltage reading for the white surface should be approximately -10 V dc.
- The white reflectance voltage and the black reflectance voltage must have a minimum difference of 4.5 V.
- If necessary, rotate POTENTIOMETER R108 on the MASTER BOARD.
- The BAR CODE READER must be able to identify slides correctly at fast and slow insertion speeds.

TIP SEAT — Height

- The height of the TIP SEAT is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3346. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Colorimetric "SLIDE NOT IDENTIFIED"

To Check for Correct Operation:

In the slide processing or "Predict" mode, insert slides for different colorimetric chemistries. If the system identifies all slides correctly and no error message is displayed, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The operator did not insert the slide correctly.	Provide the following information to the operator: - Place the slide on the Loading Station with the notch in first and the BAR CODE up. - Use a stable, uniform motion to push the slide with the SLIDE ADVANCE LEVER. - Do not push the SLIDE ADVANCE LEVER too fast.
The BAR CODE on the slide is not correct. The BAR CODE on the slide is not dark enough to be detected by the BAR CODE READER.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.
The BAR CODE READER is dirty.	Use a dry swab and clean the BAR CODE READER.
The BAR CODE READER is not adjusted correctly.	Do the adjustment for the BAR CODE READER. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in the service manual.
The BAR CODE READER has a malfunction.	- Check to see if the red light beams from the BAR CODE READER are visible. - If no red light is visible, install a replacement for the BAR CODE READER. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.
POTENTIOMETER R47 on the DRIVER BOARD has a malfunction.	Install a replacement for the DRIVER BOARD. See the Parts and Removals for the DTE MODULE, section 11 in this service manual.
Single-Board Configuration	
POTENTIOMETER R108 on the MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.

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Error Message — Potentiometric "SLIDE NOT IDENTIFIED"

Description

When a slide is inserted, the BAR CODE READER detects the reflection from the white slide surface. The computer recognizes that a slide has been loaded into the SPOTTING STATION.

Next, the computer expects to receive data to identify the slide as potentiometric. The BAR CODE on each slide has 3 lines that indicate the type of slide.

Finally, the Slide Identification System expects to detect the chemistry and the Generation No. If the Slide Identification System recognizes the 3 lines for a slide, but cannot decode the sections of the BAR CODE that identify the chemistry and the Generation No., the message "SLIDE NOT IDENTIFIED" is displayed in the LC DISPLAY.

Special Tools:

MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Possible Replacement Parts

BAR CODE READER 350248
CDM

Additional Information

Operator's Manual for the *Kodak Ektachem DT60* ANALYZER
Normal Operation — DTE MODULE, section 3 in the service manual
"Slide Identification System"
Adjustments and Special Procedures — DTE MODULE
BAR CODE READER — Voltage

Specifications for the DTE MODULE

BAR CODE READER - Voltage

- Connect:

MULTIMETER TL-3424	
+	-
INTERFACE BOARD, TP20	INTERFACE BOARD, TP1

- Use only the white surface of BAR CODE SLIDE TL-3482. Load the tool slide over the BAR CODE READER. The white surface should be down.
- The voltage reading for the white surface should be approximately -5.25 to -5.75 V dc.
- If necessary, rotate POTENTIOMETER R30 on the INTERFACE BOARD to adjust the voltage.
- The BAR CODE READER must be able to identify slides correctly at fast and slow insertion speeds.

Potentiometric "SLIDE NOT IDENTIFIED"

To Check for Correct Operation:

In the slide processing or "Predict" mode, insert slides for different potentiometric chemistries. If the system identifies all slides correctly and no error message is displayed, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The operator did not insert the slide correctly.	Provide the following information to the operator: <ul style="list-style-type: none">- Place the slide on the LOADING STATION with the notch in first and the BAR CODE down.- Use a stable, uniform motion to push the slide with the SLIDE ADVANCE LEVER.- Do not push the SLIDE ADVANCE LEVER too fast.
The BAR CODE on the slide is not correct. The BAR CODE on the slide is not dark enough to be detected by the BAR CODE READER.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.
The GLASS WINDOW over the BAR CODE READER is dirty.	Use a dry swab and clean the GLASS WINDOW over the BAR CODE READER.
The BAR CODE READER is not adjusted correctly.	Do the voltage adjustment for the BAR CODE READER. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in the service manual.
The BAR CODE READER has a malfunction.	<ul style="list-style-type: none">- Check to see if the red light beams from the BAR CODE READER are visible.- If no red light is visible, install a replacement for the BAR CODE READER. See the Parts and Removals for the DTE MODULE, section 11 in this service manual.

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Error Message — "REMOVE CM SLIDE"

DT60 ANALYZER

Description

When a slide is inserted, the BAR CODE READER detects the reflection from the white slide surface. The computer recognizes that a slide has been loaded into the SPOTTING STATION.

Next, the computer expects to receive data to identify the slide as colorimetric. The BAR CODE on each slide has 3 lines that indicate the type of slide. If the Slide Identification System in the DT60 ANALYZER does not recognize a colorimetric slide code, the message "REMOVE CM SLIDE" is displayed in the LC DISPLAY.

IMPORTANT

In some DT60 ANALYZERS with Single-Board configuration and version 11.0 software installed, an intermittent false "REMOVE CM SLIDE" message can occur. Modification kit No. 14 should be installed to repair this malfunction.

Special Tools:

MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Possible Replacement Parts

BAR CODE READER 350246
CDM

Additional Information

Operator's Manual for the Kodak Ektachem DT60 ANALYZER

Normal Operation — DT60 ANALYZER, section 2 in the service manual
"Slide Identification System"

Adjustments and Special Procedures — DT60 ANALYZER

BAR CODE READER — Multi-Board Configuration
BAR CODE READER — Single-Board Configuration

IMPORTANT

The height adjustment for the TIP SEAT must be checked after the PIPETTE LOCATOR COVER is removed and installed.

Specifications for the DT60 ANALYZER

BAR CODE READER — Multi-Board Configuration

- Connect:

MULTIMETER TL-3424	
+	-
DRIVER BOARD, TP5	MOTHER BOARD, TP1

- Insert the BAR CODE SLIDE TL-3482 with the white side up.
- If the TAB on the BAR CODE READER is toward the left of the ANALYZER, the voltage should be -5.25 to -5.75 V dc.
- If the TAB on the BAR CODE READER is toward the front or the back of the ANALYZER, the voltage should be -4.25 to -4.75 V dc.
- If necessary, rotate POTENTIOMETER R47 on the DRIVER BOARD

BAR CODE READER — Single Board Configuration

- Connect:

MULTIMETER TL-3424	
+	-
MASTER BOARD, TP14	MASTER BOARD, TP1

- Use the white surface and the black surface of BAR CODE SLIDE TL-3482. Insert the tool slide.
- The voltage reading for the white surface should be approximately -10 V dc.
- The white reflectance voltage and the black reflectance voltage must have a minimum difference of 4.5 V.
- If necessary, rotate POTENTIOMETER R108 on the MASTER BOARD.
- The BAR CODE READER must be able to identify slides correctly at fast and slow insertion speeds.

TIP SEAT — Height

- The height of the TIP SEAT is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3346. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

"REMOVE CM SLIDE"

To Check for Correct Operation:

In the slide processing or "Predict" mode, insert slides for different colorimetric chemistries. If the system identifies all slides correctly and no error message is displayed, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
If the message is displayed intermittently when no slide was inserted, the DT60 ANALYZER is Single-Board configuration with version 11.0 software. Installation of Modification No. 14 is necessary.	Install Modification kit No. 14.
The operator did not insert the slide correctly.	Provide the following information to the operator: - Place the slide on the LOADING STATION with the notch in first and the BAR CODE up. - Use a stable, uniform motion to push the slide with the SLIDE ADVANCE LEVER. - Do not push the SLIDE ADVANCE LEVER too fast.
The operator inserted a potentiometric slide or a rate slide.	Ask the operator to use the correct slide. Provide information about the differences between the colorimetric slides and other slides.
The BAR CODE on the slide is not correct. The BAR CODE on the slide is not dark enough to be detected by the BAR CODE READER. The customer used a slide that was not made by Kodak.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.
The BAR CODE READER is dirty.	Use a dry swab and clean the BAR CODE READER.
The BAR CODE READER is not adjusted correctly.	Do the adjustment for the BAR CODE READER. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in the service manual.
The BAR CODE READER has a malfunction.	- Check to see if the red light beams from the BAR CODE READER are visible. - If no red light is visible, check that CONNECTOR J18 is seated correctly on the MOTHER BOARD or the MASTER BOARD. - If necessary, install a replacement for the BAR CODE READER. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.

"REMOVE CM SLIDE" - Continued

Possible Causes	Recommended Actions
Multi-Board Configuration	
POTENTIOMETER R47 on the DRIVER BOARD has a malfunction.	Install a replacement for the DRIVER BOARD. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.
Single-Board Configuration	
POTENTIOMETER R108 on the MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.

Error Message — "DISCARD PM SLIDE AND REPEAT"

DTE MODULE

Description

When a slide is inserted, the BAR CODE READER detects the reflection from the white slide surface. The computer recognizes that a slide has been loaded into the SPOTTING STATION of the *DTE* MODULE.

Next, the computer expects to receive data to identify the slide as potentiometric. The BAR CODE on each slide has 3 lines that indicate the type of slide. If the Slide Identification System in the *DTE* MODULE and the *DT60* ANALYZER does not recognize a potentiometric slide code, the message "DISCARD PM SLIDE AND REPEAT" is displayed in the LC DISPLAY.

Special Tools:

MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Possible Replacement Parts

BAR CODE READER 350248
CDM

Additional Information

Operator's Manual for the *Kodak Ektachem DT60* ANALYZER
Normal Operation — *DTE* MODULE, section 3 in the service manual
"Slide Identification System"
Adjustments and Special Procedures — *DTE* MODULE, section 9 in the service manual
BAR CODE READER — Voltage

Specifications for the *DTE* MODULE

BAR CODE READER — Voltage

- Connect:

MULTIMETER TL-3424	
+	-
INTERFACE BOARD, TP20	INTERFACE BOARD, TP1

- Use only the white surface of BAR CODE SLIDE TL-3482. Load the tool slide over the BAR CODE READER. The white surface should be down.
- The voltage reading for the white surface should be approximately -5.25 to -5.75 V dc.
- If necessary, rotate POTENTIOMETER R30 on the INTERFACE BOARD to adjust the voltage.
- The BAR CODE READER must be able to identify slides correctly at fast and slow insertion speeds.

"DISCARD PM SLIDE AND REPEAT"

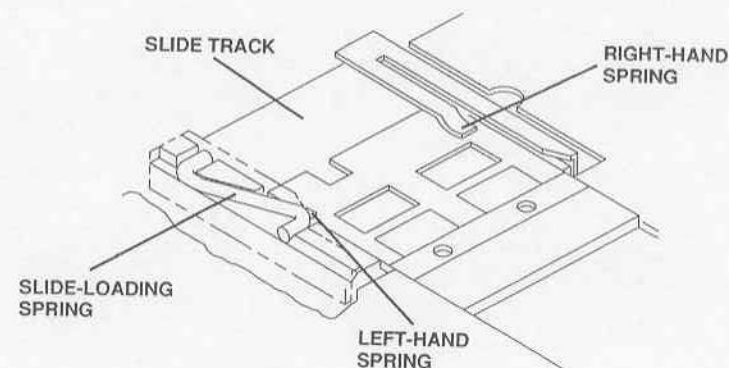
To Check for Correct Operation:

In the slide processing or "Predict" mode, insert slides for different potentiometric chemistries. If the system identifies all slides correctly and no error message is displayed, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The operator did not insert the slide correctly.	Provide the following information to the operator: <ul style="list-style-type: none"> - Place the slide on the LOADING STATION with the notch in first and the BAR CODE down. - Use a stable, uniform motion to push the slide with the SLIDE ADVANCE LEVER. - Do not push the SLIDE ADVANCE LEVER too fast.
The operator inserted a colorimetric slide or a rate slide.	Ask the operator to use the correct slide. Provide information about the differences between the potentiometric slides and other slides.
The BAR CODE on the slide is not correct. The BAR CODE on the slide is not dark enough to be detected by the BAR CODE READER. The customer used a slide that was not made by Kodak.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.
The GLASS WINDOW over the BAR CODE READER is dirty.	Use a dry swab and clean the GLASS WINDOW over the BAR CODE READER.
The BAR CODE READER is not adjusted correctly.	Do the voltage adjustment for the BAR CODE READER. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in the service manual.
The BAR CODE READER has a malfunction.	<ul style="list-style-type: none"> - Check to see if the red light beams from the BAR CODE READER are visible. - If no red light is visible, check that CONNECTOR J1 is seated correctly on the INTERFACE BOARD in the DTE MODULE. - If necessary, install a replacement for the BAR CODE READER. See the Parts and Removals for the DTE MODULE, section 11 in this service manual.

"DISCARD PM SLIDE AND REPEAT" - Continued

Possible Causes	Recommended Actions
The SURFACE PLATE is not installed correctly and prevents the slide from inserting smoothly over the BAR CODE READER. A damaged LEFT-HAND SPRING, RIGHT-HAND SPRING, or SLIDE-LOADING SPRING prevents the slide from moving smoothly over the BAR CODE READER.	Check that the SURFACE PLATE is installed correctly and the SCREWS are tightened, but not overtightened. Use PUSH-PULL SCALE TL-1079 and check the slide insertion force: <ul style="list-style-type: none"> - Remove the SPOTTING STATION PIPETTE LOCATOR and the old slide remaining in the SPOTTING STATION. - Place a new slide on the SLIDE TRACK and push the SLIDE ADVANCE LEVER with the PUSH-PULL SCALE. - Check that the force used to move the slide into the SPOTTING STATION is 2 to 12 oz., the LEFT-HAND SPRING and the RIGHT-HAND SPRING are lifted, and the SLIDE-LOADING SPRING presses against the right side of the SLIDE TRACK when the slide is moved into the SPOTTING STATION. See the figure on this page. - Check each SPRING for damage, and install a new SPRING if necessary.



E004_0064B/C A
E004_0064B/C

Error Messages — Colorimetric "RESULTS ABOVE/BELOW ANALYZER RANGE"

DT60 ANALYZER

Description

A high value limit and a low value limit for each chemistry are stored in the CDM. Each result for each chemistry is compared with the stored limits.

If the calculated value for a chemistry is higher than the high limit stored in the CDM, the message "RESULTS ABOVE ANALYZER RANGE" is displayed on the printout. If the calculated value for a chemistry is lower than the low limit stored in the CDM, the message "RESULTS BELOW ANALYZER RANGE" is displayed on the printout. When either message occurs, no test results are displayed. These messages can occur in the processing mode or in the calibration mode.

A patient sample might have an actual value that is not within the stored limits for a chemistry. This condition will cause the message to be displayed. For example, a patient with "diabetes" could have a "GLU" result that is not within the range for the ANALYZER.

IMPORTANT

If the message, "RESULTS ABOVE ANALYZER RANGE", is caused by a test that is not within the stored limits, the sample fluid should be diluted and the test should be processed again.

Special Tools and Materials:

MULTIMETER TL-3424

TEMPERATURE PROBE TL-2598

TIP HEIGHT ADJUSTMENT GAUGE TL-3346

CALIBRATION LABEL, Publication No. XP3100-28

Possible Replacement Parts

None.

Additional Information

Operator's Manual for the *Kodak Ektachem DT60 ANALYZER*

Diagnostics — *DT60 ANALYZER* and *DTE MODULE*

"Problems with Precision and Accuracy"

Adjustments and Special Procedures — *DT60 ANALYZER*

D_R Procedure

Correction Factors Procedure

INCUBATOR — Temperature

IMPORTANT

The height adjustment for the TIP SEAT must be checked after the PIPETTE LOCATOR COVER is removed and installed.

Specifications

INCUBATOR — Temperature

The calculated average value of 3 high and 3 low temperatures measured at the SPOTTING STATION must be 37.5° to 38.2° C (99.5° to 100.9° F)

TIP SEAT — Height

The height of the TIP SEAT is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3346. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Correction Factors Procedure

If a message is displayed for a CREA or NH₃ test, do the procedure for the **yellow LED**.

If a message is displayed for a BUN/UREA, URIC, HDLC, Mg, or PHOS test, do the procedure for the **red LED**.

If a message is displayed for a AMYL, CHOL, GLU, Hb, TBIL, TP, or TRIG test, do the procedure for the **green LED**.

Colorimetric "RESULTS ABOVE/BELOW ANALYZER RANGE"

To Check for Correct Operation:

Operate the DT60 ANALYZER with slides for the same chemistry that caused the error. If the error message does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
If the Error Message Occurred During the Calibration Mode:	
The results for the CALIBRATOR fluid are not within the operating limits of the DT60 ANALYZER or the DTE MODULE.	Check that the CALIBRATORS were prepared correctly. See the Operator's Manual for the correct procedures.
Manually entered data was not correct.	Execute Option 32. - Compare the 2 printouts and check that the calibration values stored in the DT60 ANALYZER are the same as the manually entered values. - Check that the date on the Option 32 printout is not more than 90 days old. - Check that the lot No. and the generation No. are the same as the lot No. and generation No. used when the ANALYZER was calibrated.
The DT60 ANALYZER was not calibrated after the new correction factors were calculated.	Calibrate the DT60 ANALYZER.
If the Error Message Occurred During the Test Processing Mode:	
The concentration of the sample fluid is not within the operating limits of the equipment.	The customer should process control fluids. - If the results are within the manufacturer specifications for the control fluids, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098. - If the results are not within the specifications, advance to the following section of this diagnostic table.
If the Error Message Occurred During the Test Processing Mode or Calibration Mode:	
The operator did not follow the correct procedures for preparing and storing the fluids.	See the Operator's Manual for information about the correct procedures.
The operator did not follow the correct procedures for storing and using the slides.	See the Operator's Manual for information about the correct procedures. Check for the following conditions: - The slides are not stored correctly. - The slides are too old. - The lot No. of the slides has changed and the ANALYZER was not calibrated for the new lot No.
The slides are not providing results that are within the operating specifications for the DT60 ANALYZER.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

Colorimetric "RESULTS ABOVE/BELOW ANALYZER RANGE" - Continued

Possible Causes	Recommended Actions
If the Error Message Occurred During the Test Processing Mode or Calibration Mode, continued:	
The optics in the DT60 ANALYZER have a malfunction.	Do the DR Procedure. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 of this service manual. - If the results of the DR Procedure are not successful, do the Correction Factors procedure for the LED color corresponding to the chemistry that caused the error message. See the Adjustments and Special Procedures, section 8 of this service manual. IMPORTANT: Do a full wet calibration for all chemistries that use an LED with revised correction factors. - If the results of the DR Procedure are successful, advance to the following section of this diagnostic table.
The operator does not operate the Kodak Ektachem DT PIPETTE correctly.	Provide the following information to the operator about the correct operation of the DT PIPETTE: - The TIP must be seated correctly on the DT PIPETTE. - The PIPETTE should be removed from the fluid immediately after the first "beep" sound. - The TIP should be wiped correctly. - The quantity of fluid in the TIP should be correct. - No fluid should fall onto the slide until after the operator has dispensed a drop by pressing the BUTTON on the DT PIPETTE. A drop of fluid that reaches the slide before the dispensed drop is a "pre-spot". - The DT PIPETTE should be removed from the PIPETTE LOCATOR after the "beep" sound.
The temperature of the INCUBATOR is not within the operating specifications for the ANALYZER.	Check that the temperature of the INCUBATOR is adjusted correctly. See the Adjustments and Special Procedures, section 8 of this service manual. IMPORTANT: If the PIPETTE LOCATOR COVER is removed and installed, the height of the TIP must be adjusted.
The height of the TIP is not adjusted correctly.	Do the height adjustment for the TIP. See the Adjustments and Special Procedures, section 8 of this service manual.

Error Messages — Potentiometric "RESULTS ABOVE/BELOW ANALYZER RANGE"

DTE MODULE

Description

A high value limit and a low value limit for each chemistry are stored in the CDM. Each result for each chemistry is compared with the stored limits.

If the calculated value for a chemistry is higher than the high limit stored in the CDM, the message "RESULTS ABOVE ANALYZER RANGE" is displayed on the printout. If the calculated value for a chemistry is lower than the low limit stored in the CDM, the message "RESULTS BELOW ANALYZER RANGE" is displayed on the printout. When either message occurs, no test results are displayed. These messages can occur in the processing mode or in the calibration mode.

A patient sample might have an actual value that is not within the stored limits for a chemistry. This condition will cause the message to be displayed. For example, a patient could have a "K+" result that is not within the range for the ANALYZER.

IMPORTANT

If the message, "RESULTS ABOVE ANALYZER RANGE", is caused by a test that is not within the stored limits, the sample fluid should be diluted and the test should be processed again.

Special Tools and Materials:

FORS ADJUSTMENT BOARD TL-3340
PUSH-PULL SCALE TL-1079
MULTIMETER TL-3424
CALIBRATION LABEL, Publication No. XP3100-28
3 new or used potentiometric slides

Possible Replacement Parts, DTE MODULE:

INCUBATION BOOT 352744
LEFT-HAND SPRING 618266
RIGHT-HAND SPRING 618265
SLIDE-LOADING SPRING 618251
ELECTROMETER BOX ASSEMBLY, Type 2, 351800

Additional Information

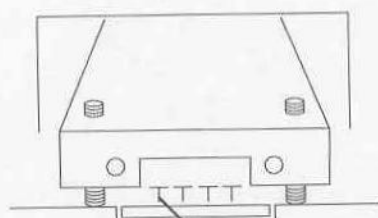
Operator's Manual for the *Kodak Ektachem DT60 ANALYZER*
Options for the *Kodak Ektachem DT System*
Diagnostics — *DT60 ANALYZER* and *DTE MODULE*
 "Problems with Precision and Accuracy"
Adjustments and Special Procedures — *DTE MODULE*
 ELECTROMETER CONTACTS - Compression Adjustment
 Contact Verification Test
Parts and Removals — *DTE MODULE*

Specifications for the Contact Verification Test

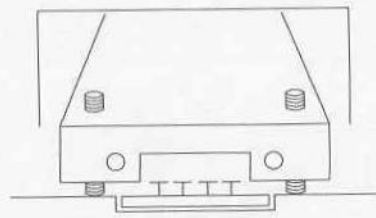
When reference fluid is used in both DROP WELLS of a potentiometric slide and the slide is processed as a test, the "MV" value on the printout should be **-5.0 mV to +5.0 mV**.

Specifications for the Compression Adjustment — ELECTROMETER CONTACTS

- When a slide is in the SPOTTING STATION, the ELECTROMETER CONTACTS should compress 0.75 to 1.0 mm (0.03 to 0.04 in.).

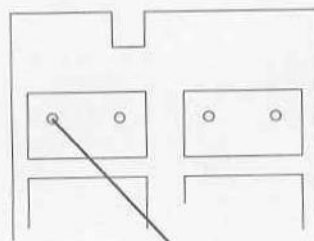


ELECTROMETER CONTACT

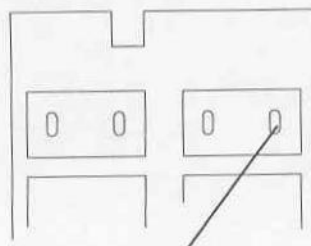


E004_0073BCA
E004_0073BC

- When the compression is adjusted correctly, the 4 CONTACTS should puncture the ELECTRODES on the slide and make 4 small holes in the emulsion. With MAGNIFIER TL-1442, these holes should be visible when the slide is placed in front of a light source. The ELECTRODES should not be scratched adjacent to the punctured holes. See the following figures for examples of CONTACT MARKS that are correct and not correct.



Correct CONTACT MARK



CONTACT MARK, not correct

E004_0058BCA
E004_0058BC

- The result of the Contact Verification Test should be within specifications.

Potentiometric "RESULTS ABOVE/BELOW ANALYZER RANGE"

To Check for Correct Operation:

Operate the DTE MODULE with slides for the same chemistry that caused the error. If the error message does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

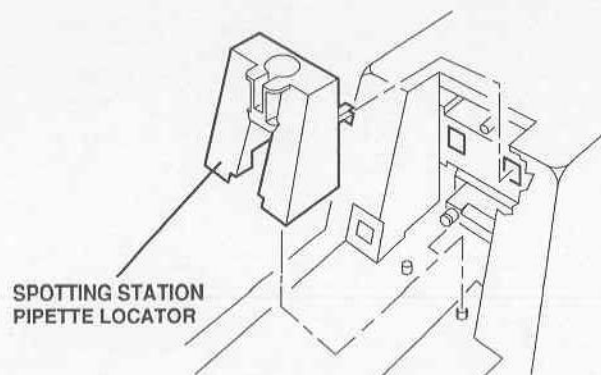
Possible Causes	Recommended Actions
If the Error Message Occurred During the Calibration Mode:	
The results for the CALIBRATORS are not within the operating limits of the DTE MODULE.	Check that the CALIBRATORS and the reference fluid were prepared correctly. See the Operator's Manual for the correct procedures.
Manually entered data was not correct.	Execute Option 32. <ul style="list-style-type: none">- Compare the 2 printouts and check that the calibration values stored in the DT60 ANALYZER are the same as the manually entered values.- Check that the date on the Option 32 printout is not more than 90 days old.- Check that the lot No. and the generation No. are the same as the lot No. and generation No. used when the ANALYZER was calibrated.
If the Error Message Occurred During the Test Processing Mode:	
The concentration of the sample fluid or the reference fluid is not within the operating limits of the equipment.	The customer should process control fluids and use new reference fluid. <ul style="list-style-type: none">- If the results are within the manufacturer specifications for the control fluids, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.- If the results are not within the specifications, advance to the following section of this diagnostic table.
If the Error Message Occurred During the Test Processing Mode or the Calibration Mode:	
The operator did not follow the correct procedures for preparing and storing the fluids.	See the Operator's Manual for information about the correct procedures.
The operator did not follow the correct procedures for storing and using the slides.	See the Operator's Manual for information about the correct procedures. Check for the following conditions: <ul style="list-style-type: none">- The slides are not stored correctly.- The slides are too old.- The lot No. of the slides has changed and the ANALYZER was not calibrated for the new lot No.
The operator did not use the correct procedure to aspirate the sample fluid and the reference fluid.	Check that the DTE PIPETTE is inserted through the ASPIRATING STATION PIPETTE HOLDER and the RESERVOIR HOLDER is in the closed position when the sample and reference fluids are aspirated.
The slides are not providing results that are within the operating specifications for the DTE MODULE.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

To Check for Correct Operation:

Operate the DTE MODULE with slides for the same chemistry that caused the error. If the error message does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

Errors in Interface between the Slide and the CONTACTS

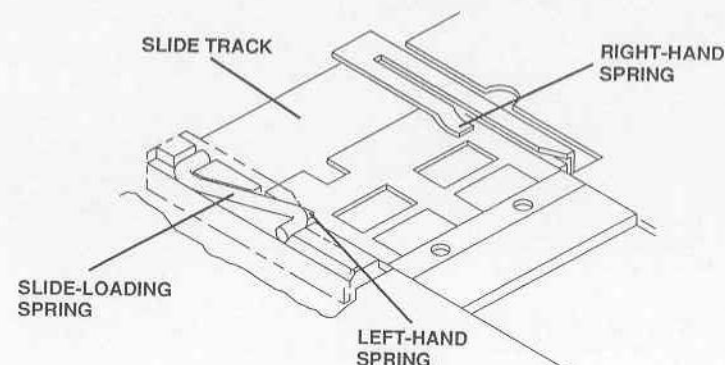
Possible Causes	Recommended Actions
The SPOTTING STATION PIPETTE LOCATOR is not seated correctly.	Ask the operator to check the position of the SPOTTING STATION PIPETTE LOCATOR and, if necessary, install and seat it correctly. See the figure on the bottom of this page. Ask the operator to process potentiometric slides and check if the error message occurs again.
The ELECTROMETER CONTACTS do not touch the slide with the correct compression.	Do the Contact Verification Test. See the specifications included in this diagnostic, or the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual. NOTE If the test is successful, advance to the "Metering Errors" section of this table.
The ELECTROMETER CONTACTS do not make the correct CONTACT MARKS on the slides.	Check the CONTACT MARKS on the potentiometric slides. See "To Check:" in the adjustment procedure, "ELECTROMETER CONTACTS — Compression", Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.
The SURFACE PLATE is not installed correctly.	Check that the SURFACE PLATE is installed correctly and the SCREWS are tightened, but not overtightened.



E004_0030BCA
E004_0030BC

Errors in Interface between the Slide and the CONTACTS — Continued

Possible Causes	Recommended Actions
A damaged LEFT-HAND SPRING, RIGHT-HAND SPRING, or SLIDE-LOADING SPRING prevents the slide from being placed and held in the correct position under the ELECTROMETER CONTACTS.	<ul style="list-style-type: none"> - Use PUSH-PULL SCALE TL-1079 and check the slide insertion force: • Remove the SPOTTING STATION PIPETTE LOCATOR and the old slide remaining in the SPOTTING STATION. • Place a new slide on the SLIDE TRACK and push the SLIDE ADVANCE LEVER with the PUSH-PULL SCALE. • Check that the force used to move the slide into the SPOTTING STATION is 2 to 12 oz., the LEFT-HAND SPRING and the RIGHT-HAND SPRING are lifted, and the SLIDE-LOADING SPRING presses against the right side of the SLIDE TRACK when the slide is moved into the SPOTTING STATION. See the figure at the bottom of this page. • Install a new SPRING if necessary.
The compression of the ELECTROMETER CONTACTS is not adjusted correctly, or the ELECTROMETER CONTACTS have a malfunction.	<ul style="list-style-type: none"> - If the ELECTROMETER ASSEMBLY has 2 ADJUSTMENT SETSCREWS, do the compression adjustment for the ELECTROMETER CONTACTS. - If the ELECTROMETER ASSEMBLY has no ADJUSTMENT SETSCREWS, or if the CONTACTS are damaged, install a new ELECTROMETER ASSEMBLY.



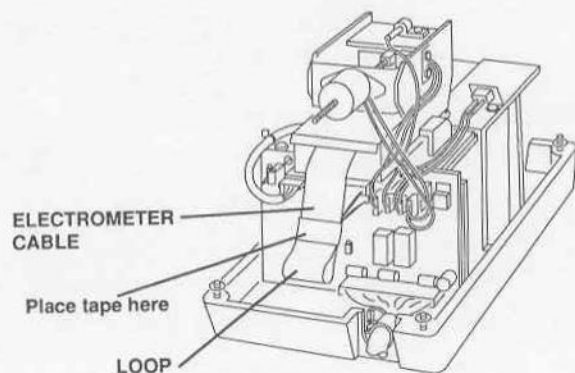
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E004_0064BC

To Check for Correct Operation:

Process the slides that were being processed when Error Code E20 occurred. The error code should not occur again. Check for an intermittent error code if necessary.

Errors in Interface between the Slide and the CONTACTS — Continued

Possible Causes	Recommended Actions
The ELECTROMETER has erratic motion between the left side and the right side during the actuation of the LINEAR ACTUATOR. This motion causes variation in the CONTACT MARKS on the slides. Some older ELECTROMETERS have excessively long CABLES that cause or allow the erratic motion.	<p>To obtain the correct uniform motion of the ELECTROMETER, do the following steps to make the ELECTROMETER CABLE shorter:</p> <ul style="list-style-type: none"> - Make a LOOP in the CABLE. - Use 12.7 mm (0.50 in.) adhesive tape. Place the tape around the CABLE to hold the LOOP approximately 12.7 mm (0.50 in.) from the end. See the following figure. - After the tape is attached, check that the ELECTROMETER has fully free motion, and that the FLAG can move into the HOME SENSOR. - Execute Options 40 and 41 and observe the HOME SENSOR LED.



E004_0031BCA
E004_0031BC

Metering Errors — Versions 9.0 and 10.7 Software only

Possible Causes	Recommended Actions
The Kodak Ektachem DTE PIPETTE has a malfunction.	<p>Use the DTE PIPETTE to aspirate sample and reference fluids. Remove the PIPETTE from the PIPETTE LOCATOR and check for the following conditions:</p> <ul style="list-style-type: none"> - The TIPS are seated correctly. - The PIPETTE has no leakage. - The TIPS hold equal quantities of fluid. - No fluid was aspirated into the PROBOSCIS. <p>For any other malfunction of the DTE PIPETTE, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.</p>

Errors in Storing or Preparing the Fluids

Possible Causes	Recommended Actions
An excessively high concentration of a fluid used in processing slides might cause an excessive difference in the measured electrical potential of the ELECTRODES on the slide. This condition could cause the results to be too high or too low for the software limits.	<ul style="list-style-type: none"> - Check that the fluids were stored and prepared correctly. See the diagnostic, "Problems with Precision and Accuracy", in this section of the service manual. - If necessary, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

Error Condition — "SPOT SLIDE" Message Remains after Metering has Occurred

DT60 ANALYZER

Description

The SPOT DETECTOR SENSOR monitors the light reflectance from the center of the slide. When a drop is dispensed on the slide, the change in light reflectance causes the SPOT DETECTOR SENSOR to send a signal indicating that a slide has been spotted.

In normal operation, when the computer detects the signal from the SPOT DETECTOR SENSOR, the "SPOT SLIDE" message is cleared and a tone signal occurs. The operator should remove the DT PIPETTE from the PIPETTE LOCATOR after the message and tone signal. If "SPOT SLIDE" is not cleared from the LC DISPLAY, the Slide Metering System has a malfunction.

Special Tools:

MULTIMETER TL-3424

WHITE REFERENCE SLIDE TL-3344

Possible Replacement Parts

SPOT DETECTOR SENSOR 343882

Additional Information

Normal Operation — DT60 ANALYZER

"Slide Spotting System"

Adjustments and Special Procedures

SPOT DETECTOR SENSOR — Voltage

TIP SEAT — Height

Kodak Ektachem DT PIPETTE — Checkout Procedure

Parts and Removals — DT60 ANALYZER

Specifications

SPOT DETECTOR SENSOR — Voltage

When a WHITE REFERENCE SLIDE TL-3344 is placed in the SPOTTING STATION, the voltage is:

- +6.00 to +6.50 V dc if the SLIDE TL-3344 is from Lot No. 9151-5067-1175, or from a lot manufactured after June 1989.
- +5.50 to +6.00 V dc if the SLIDE TL-3344 is from a lot that was obtained before June 1989.

TIP SEAT — Voltage

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3346. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Error Condition - "SPOT SLIDE" Message Remains after Spotting

To Check for Correct Operation:

Operate the DT60 ANALYZER in the test processing mode to process different slides. If the Slide Spotting System responds correctly and the error condition does not occur again, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The DT PIPETTE does not dispense drops correctly.	Do the checkout procedure for the Kodak Ektachem DT PIPETTE. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.
The SPOT DETECTOR SENSOR is dirty.	Use warm water and a dry swab, and clean the SPOT DETECTOR SENSOR. See "Instrument Care and Cleaning," section 5 in the Operator's Manual.
The SPOT DETECTOR SENSOR is not seated correctly in the PIPETTE LOCATOR.	Check that the SENSOR is attached tightly above the groove in the PIPETTE LOCATOR.
The SPOT DETECTOR SENSOR is not adjusted correctly.	If necessary, adjust the SPOT DETECTOR SENSOR. See the Adjustments and Special Procedures, section 8 in this service manual.
CONNECTOR J17 for the SPOT DETECTOR SENSOR is not seated correctly on either the MOTHER BOARD or the MASTER BOARD.	Seat CONNECTOR J17 correctly.
The SPOT DETECTOR SENSOR has a malfunction.	Install a replacement for the SPOT DETECTOR SENSOR. See Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.
The PIPETTE LOCATOR is not installed correctly, so that the SPOT DETECTOR SENSOR is not in the correct position to detect the slide.	Check the installation of the PIPETTE LOCATOR and the SURFACE PLATE. If necessary, install the PIPETTE LOCATOR or the SURFACE PLATE correctly.
The height of the TIP SEAT is not adjusted correctly.	Do the height adjustment for the TIP SEAT. See the Adjustments and Special Procedures, section 8 of this service manual.

Error Condition — "SELF TEST OK" Message Is Not Displayed: Initialization is Not Completed

DT60 ANALYZER

Description

During the initialization sequence, 4 functions occur:

- First, the PRINTER INTERFACE BOARD sends a signal to start the PRINTER MOTOR. The MOTOR operates to move the PRINT HEAD through 2 cycles without making any characters on the printout. Field personnel can observe the movement of the PRINT HEAD when initialization begins.
- Next, the electronic components are initialized. When electronic initialization is completed, the message "SELF TEST OK" is displayed on the printout.
- Then, the mechanical components are initialized. When mechanical initialization is completed, the message "EMPTY SLIDE DISPOSAL BOX" is displayed on the printout.
- During the initialization of the electronic and mechanical components, the Temperature Monitoring and Control Circuit is initialized. When all 3 conditions of initialization are completed successfully, the message "ANALYZER READY" is displayed in the LC DISPLAY.

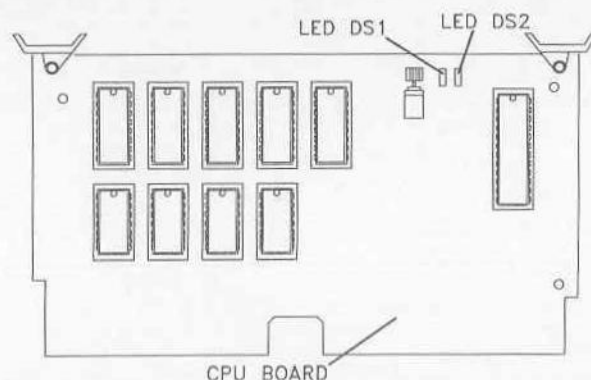
This diagnostic provides diagnostic procedures for any problems that might occur during the electrical initialization only. If initialization of the electrical components cannot be completed, the DT60 ANALYZER does not provide the "SELF TEST OK" message on the printout, and the mechanical components and the Temperature Monitoring and Control Circuit are not initialized.

NOTE

If malfunctions occur during initialization of the mechanical components, an "F" error code is displayed in the LC DISPLAY. See the diagnostic procedures for the "F" codes.

If malfunctions occur during the initialization of the Temperature Monitoring and Control Circuit, "H" error codes are displayed in the LC DISPLAY. See the diagnostic procedures for the "H" codes.

In the Multi-Board configuration, malfunctions that occur during initialization can be diagnosed by observing the status of LED DS1 and LED DS2 on the CPU BOARD.



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E003_0067BA

XP3100-17

Special Tools:

MULTIMETER TL-3424
FORS EXTENDER BOARD TL-3340

Possible Replacement Parts

POWER SUPPLY ASSEMBLY 616818
CPU BOARD 613941 - Software Version 9.0
CPU BOARD 352616 - Software Version 10.7 and above
MOTHER BOARD 352495
MASTER BOARD 352658

Additional Information

Normal Operation — DT60 ANALYZER

Diagrams — DT60 ANALYZER

Adjustments and Special Procedures — DT60 ANALYZER

NON-VOLATILE RAM — Obtaining/Clearing/Entering Data

POWER SUPPLY — Checkout Procedure

Parts and Removals — DT60 ANALYZER

Specifications

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

IMPORTANT

Before removing any CIRCUIT BOARDS or INTEGRATED CIRCUITS that store the necessary data for processing tests, do the procedure to obtain data from the NON-VOLATILE RAM. Enter the data after completing the repair or replacement procedure. See the Adjustments and Special Procedures, section 8 in this service manual.

"SELF TEST OK" Message Is Not Displayed: Initialization Is Not Successful

To Check for Correct Operation:

Reset the DT60 ANALYZER and allow initialization to occur. If the "ANALYZER READY" message is displayed in the LC DISPLAY, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
Multi-Board Configuration only:	
<ul style="list-style-type: none"> - The EDGE CONNECTORS for the vertical CIRCUIT BOARDS are not seated correctly in the MOTHER BOARD. - The INTEGRATED CIRCUITS that are not soldered in position are not seated correctly. 	<ul style="list-style-type: none"> - Press the MAIN POWER SWITCH to the "0" position. - Remove each of the following BOARDS: CPU BOARD I/O BOARD DRIVER BOARD - Check that the INTEGRATED CIRCUITS on each BOARD are seated correctly. - Install and seat each BOARD correctly in the MOTHER BOARD. - Press the MAIN POWER SWITCH to the "1" position. Allow the DT60 ANALYZER to initialize and check that initialization is completed.
One of the following BOARDS has a malfunction: CPU BOARD I/O BOARD DRIVER BOARD	<ul style="list-style-type: none"> - Press the MAIN POWER SWITCH to the "0" position. - Remove one BOARD and install a replacement for it. - Press the MAIN POWER SWITCH to the "1" position. Allow the DT60 ANALYZER to initialize and check that initialization is completed. - Continue checking the BOARDS, one at a time.
The MOTHER BOARD has a malfunction.	Repair, or install a replacement for the MOTHER BOARD.
Single-Board Configuration only:	
INTEGRATED CIRCUIT U6 or U14 is not seated correctly on the MASTER BOARD.	<ul style="list-style-type: none"> - Press the MAIN POWER SWITCH to the "0" position. - Remove and install INTEGRATED CIRCUITS U6 and U14. Check that they are seated correctly in the SOCKETS on the MASTER BOARD.
The MASTER BOARD has a malfunction.	Install a replacement for the MASTER BOARD.
Both Configurations:	
The logic circuit for the PRINTER, or the PRINTER ASSEMBLY, has a malfunction.	See the diagnostic for malfunctions of the PRINTER, "The PRINTER Does Not Operate — Error Code F18 is Not Displayed", page 239 in this section of the service manual.
CONNECTOR J23 or CONNECTOR J25 for the POWER SUPPLY is not connected or not seated correctly.	Check that CONNECTORS J23 and J25 are seated correctly.
The internal power in the DT60 ANALYZER is not within the specifications.	<ul style="list-style-type: none"> - Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, and the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual. - Diagnose the circuit from the POWER SUPPLY to the CPU BOARD or to the MASTER BOARD. Repair or install replacement parts as necessary.

No "ID=" Message is Displayed after a Slide is Inserted

DT60 ANALYZER

Description

When a slide is inserted, the BAR CODE READER detects the reflection from the white slide surface. The changed reflectance causes a changed voltage signal in the Slide Identification System. This changed voltage indicates to the computer that a slide has been inserted and the computer starts the processing sequence. The first action in the slide processing sequence is the message "ID=" displayed in the LC DISPLAY. The operator is expected to press and enter any patient identification number, or to press , , and .

If the voltage does not change, or does not change enough to be detected, or if the signal from the BARCODE READER is not transferred correctly, no "ID=" message is displayed, and no additional actions will occur. No slides can be processed.

Special Tools:

BAR CODE SLIDE TL-3482

Possible Replacement Parts

BAR CODE READER 350246

DRIVER BOARD 352387

MASTER BOARD 352658

Additional Information

Normal Operation — DT60 ANALYZER

Slide Identification System

Adjustments and Special Procedures — DT60 ANALYZER

BAR CODE READER — Multi-Board Configuration

BAR CODE READER — Single-Board Configuration

Parts and Removals — DT60 ANALYZER

Specifications

BAR CODE READER - Multi-Board Configuration

Connect MULTIMETER TL-3424: + to TP5 on the DRIVER BOARD, and - to TP1 on the MOTHER BOARD.

Insert the BAR CODE SLIDE TL-3482 with the white side up.

If the TAB on the BAR CODE READER is toward the left of the ANALYZER, the voltage should be -5.25 to -5.75 V dc.

If the TAB on the BAR CODE READER is toward the front or the back of the ANALYZER, the voltage should be -4.25 to -4.75 V dc.

If necessary, rotate POTENTIOMETER R47 on the DRIVER BOARD Normal Operation — DT60 ANALYZER, section 2 in the service manual

BAR CODE READER — Single Board Configuration

Connect MULTIMETER TL-3424: + to TP14 on the MASTER BOARD, and - to TP1 on the MASTER BOARD.

Use the white surface and the black surface of BAR CODE SLIDE TL-3482. Insert the tool slide.

The voltage reading for the white surface should be approximately -10 V dc.

The white reflectance voltage and the black reflectance voltage must have a minimum difference of 4.5 V.

The BAR CODE READER must be able to identify slides correctly at fast and slow insertion speeds.

Error Condition

No "ID=" Message Is Displayed after a Slide Is Inserted

To Check for Correct Operation:

In the processing or "Predict" mode, insert slides for different colorimetric chemistries. If the system identifies all slides correctly and the "ID=" message is displayed, the diagnostic procedure is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The operator did not insert the slide correctly.	Provide the following information to the operator: <ul style="list-style-type: none">- Place the slide on the Loading Station with the notch in first and the BAR CODE up.- Use a stable, uniform motion to push the slide with the SLIDE ADVANCE LEVER.- Do not push the SLIDE ADVANCE LEVER too slowly.
The BAR CODE READER is dirty.	Use a dry swab and clean the BAR CODE READER.
CONNECTOR J18 from the BAR CODE READER is not seated correctly on the MOTHER BOARD or on the MASTER BOARD.	Disconnect and connect CONNECTOR J18, seating it correctly on the MOTHER BOARD or the MASTER BOARD.
The BAR CODE READER is not adjusted correctly.	Do the adjustment for the BAR CODE READER. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in the service manual.
The black area below the BAR CODE READER is too light. The BAR CODE READER does not detect a minimum change in the reflectance when a slide is inserted.	Apply black paint or black ink on the surface below the BAR CODE READER.
The BAR CODE READER has a malfunction.	<ul style="list-style-type: none">- Check to see if the red light beams from the BAR CODE READER are visible.- If no red light is visible, install a replacement for the BAR CODE READER. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.
The DRIVER BOARD or the MASTER BOARD has a malfunction.	<ul style="list-style-type: none">- Check to see if LED DS2 on the DRIVER BOARD, or LED DS1 on the MASTER BOARD flickers when a slide is inserted.- If the LED does not flicker, and the BAR CODE READER operates correctly, install a replacement for the DRIVER BOARD or for the MASTER BOARD.

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"COVER OPEN" Message is Displayed When the PIPETTE LOCATOR COVER is Closed

DT60 ANALYZER

Description

In normal operation, the COVER SWITCH is opened when the PIPETTE LOCATOR COVER is lifted and the SWITCH is closed when the COVER is closed for slide processing. If the COVER is lifted during slide processing, fluctuations of temperature or light leakage could cause errors in the calibration or test results. To prevent such errors, the computer in the DT60 ANALYZER monitors the "COVER OPEN" signal from the COVER SWITCH. The "COVER OPEN" signal is logic Hi, or +5 V dc, when the COVER SWITCH is opened. The signal is logic Lo, or 0 V dc, when the SWITCH is closed.

If the computer detects changed voltage, from 0 to +5 V dc, in the "COVER OPEN" signal, the computer monitors that signal and the internal clock. If the "COVER OPEN" signal remains Hi for > 5 seconds, the error message "COVER OPEN" is displayed in the LC DISPLAY.

In the "Status Messages" section of the Operator's Manual, the recommended action for the "COVER OPEN" message is to check that the PIPETTE LOCATOR COVER is fully closed. When the COVER is closed after being opened for more than 5 seconds, the message "INCUBATOR WARMING UP" is displayed in the LC DISPLAY for approximately 5 minutes. No slides can be processed until the "ANALYZER READY" message is displayed to indicate that the temperature of the INCUBATOR is within the software limits.

A hardware or software malfunction could prevent this normal sequence from occurring. If the "COVER OPEN" message continues to be displayed when the PIPETTE LOCATOR COVER has been fully closed, check for the possible causes in the diagnostic table.

IMPORTANT

Option 70 disables the monitoring function of the COVER SWITCH. No "COVER OPEN" message will be displayed after Option 70 has been executed. The test results might not be correct if the COVER SWITCH is disabled. To cancel Option 70, deenergize the DT60 ANALYZER.

Special Tools:

MULTIMETER TL-3424

Possible Replacement Parts

COVER SWITCH 343879

I/O BOARD 343937 — Software Version 9.0

I/O BOARD 352520 — Software Versions 10.7 and 11.0

MOTHER BOARD 352495

MASTER BOARD 352658

POWER SUPPLY ASSEMBLY 616818

Additional Information

Normal Operation — DT60 ANALYZER

Diagrams — DT60 ANALYZER

Adjustments and Special Procedures — DT60 ANALYZER

POWER SUPPLY — Checkout Procedure

Parts and Removals — DT60 ANALYZER

Specifications

POWER SUPPLY — Checkout Procedure

Circuit from POWER SUPPLY:	+	—	Correct V dc
+5 V dc circuit	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

"COVER OPEN" Message is Displayed When the PIPETTE LOCATOR COVER Is Closed

To Check for Correct Operation:

In the processing or "Predict" mode, open the PIPETTE LOCATOR COVER for a minimum of 5 seconds and check that the "COVER OPEN" message is displayed. Then close the PIPETTE LOCATOR COVER and check for the "INCUBATOR WARMING UP" message. Wait 5 minutes and check that the "ANALYZER READY" message is displayed. If the sequence is correct, and the "COVER OPEN" message does not remain displayed when the PIPETTE LOCATOR is fully closed, the diagnostic procedure is completed and the malfunction is repaired.

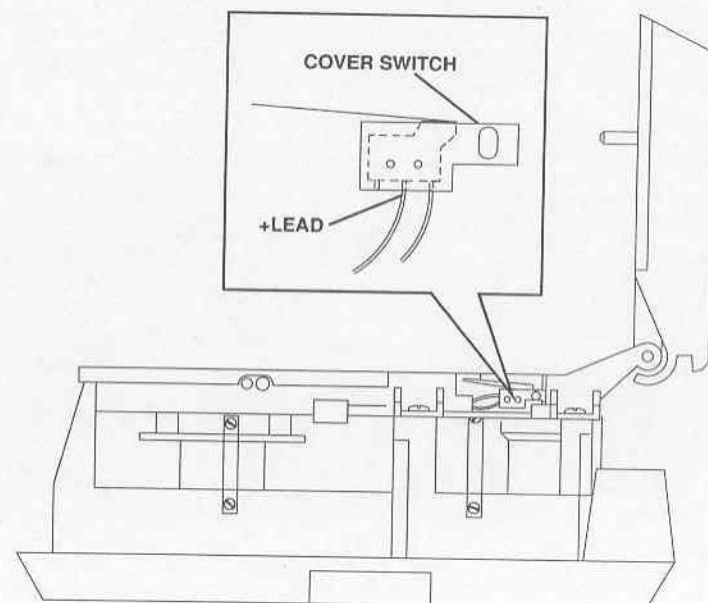
Possible Causes	Recommended Actions
CONNECTOR P20 for the COVER SWITCH is not seated correctly in J20 on the MOTHER BOARD or on the MASTER BOARD.	Seat CONNECTOR P20 correctly in J20.
The COVER SWITCH is loosened or is damaged.	<ul style="list-style-type: none"> - Tighten the SCREWS for the COVER SWITCH. - Install a replacement for the COVER SWITCH if necessary. See the Parts and Removals for the DT60 ANALYZER, section 10 in this service manual.
CONNECTOR J23 or CONNECTOR J25 for the POWER SUPPLY is not connected or not seated correctly.	Check that CONNECTORS J23 and J25 are seated correctly.
The circuit for the COVER SWITCH has a malfunction.	<ul style="list-style-type: none"> - Check the continuity between the COVER SWITCH and CONNECTOR J20 on the MOTHER BOARD or the MASTER BOARD. Install a replacement for the COVER SWITCH if necessary. - Check the voltage from the COVER SWITCH when the SWITCH is opened and when it is closed. See the figure and the table on page 231. - If the voltage is correct, install a replacement for the I/O BOARD. - If the voltage is not correct, continue to diagnose the malfunction.
The internal power in the DT60 ANALYZER is not within the specifications.	<ul style="list-style-type: none"> - Do the checkout procedure for the POWER SUPPLY. See the specifications included in this diagnostic, and the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual. - Diagnose the circuit from the POWER SUPPLY to the CPU BOARD or to the MASTER BOARD. Repair or install replacement parts as necessary.

Voltage Specification - COVER SWITCH:

The voltage from the COVER SWITCH, measured at the + LEAD, should be:

- When the COVER SWITCH is opened, 5.0 V dc.
- When the COVER SWITCH is closed, 0 V dc.

MULTIMETER TL-3424	
+	Ground
COVER SWITCH, + LEAD	MOTHER BOARD, TP1 or MASTER BOARD, TP10



Error Condition — Malfunctions of the PRINTER

Description

The following malfunctions are included in this section:

- Missing dots in the dot matrix for each character
- Very light characters on the printout
- Character density is not horizontally uniform on the printout
- Random characters on the printout — no readable text
- No visible characters are displayed on the printout
- The paper tape does not feed through the PRINTER
- The PRINTER does not operate — Error Code F18 is not displayed

Execute Option 4 to obtain a sample printout of all characters.

Special Tools

MAGNIFIER TL-1442

THERMAL PAPER TL-3424

Possible Replacement Parts

PRINTER ASSEMBLY 613307

ROLLER 340366

GUARD 352415

PRINTER INTERFACE BOARD 613957

CLM

CDM/CLM CIRCUIT BOARD 613956 — Software Version 9.0

CDM/CLM CIRCUIT BOARD 352399 — Software Versions 10.7 and 11.0

Additional Information

Normal Operation — DT60 ANALYZER

Adjustments and Special Procedures — DT60 ANALYZER

PRINTER — Character Density

Parts and Removals — DT60 ANALYZER

Specification

PRINTER - Character Density

Using paper available from Kodak, the 4 dots in the "." character must be separate.

Malfunctions of the PRINTER

Observed Condition: Missing Dots in the Dot Matrix for Each Character

Description: The character matrix has 5 dots in a horizontal row, and 7 dots in a vertical column. If the characters are printed with missing dots, use the following table.

To Check for Correct Operation: Execute Option 4 and check the printout for the original error condition. If the characters are correct, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
CONNECTOR P33 is not seated correctly in CONNECTOR J33.	Disconnect CONNECTOR P33 and connect it again. Check that it is seated correctly.
The PINS in CONNECTOR P33 are not correctly aligned with the SOCKETS in CONNECTOR J33.	Check that CONNECTOR P33 is aligned correctly with CONNECTOR J33.
The PRINTER INTERFACE BOARD is not seated in the CONNECTOR.	Check that the PRINTER INTERFACE BOARD is seated correctly.
<ul style="list-style-type: none">- The PRINthead is damaged.- The TEFLON STRIP on the PRINthead PLATEN is loosened, bent, or not installed.- The RIBBON CABLE from CONNECTOR J33 is damaged.	Install a new PRINTER ASSEMBLY.
The PRINTER INTERFACE BOARD is damaged.	Install a replacement for the PRINTER INTERFACE BOARD.

Malfunctions of the PRINTER - Continued

Observed Condition: Very Light Characters on the Printout

To Check for Correct Operation: Execute Option 4 and check the printout for the original error condition. If the characters are correct, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The customer is not using the paper tape that is recommended by Kodak.	Install THERMAL PAPER TL-3889 and execute Option 4. Check the characters on the printout. If the characters are darker, recommend that the customer order paper tape made by Kodak or an equivalent style of thermal paper.
The character density for the PRINTER is not adjusted correctly.	Adjust the character density for the PRINTER. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.
<ul style="list-style-type: none"> - The TEFLON STRIP on the PRINthead PLATEN is loosened, bent, or not installed. - The RIBBON CABLE from CONNECTOR J33 is damaged. 	Install a new PRINTER ASSEMBLY.
The MOUNTING SCREWS on the PRINthead PLATEN are tightened excessively.	<ul style="list-style-type: none"> - Loosen the MOUNTING SCREWS and tighten them again until they are "finger tight". - If the characters remain very light, install a replacement for the PRINTER ASSEMBLY. - If the characters remain too light after a replacement for the PRINTER ASSEMBLY is installed, install a replacement for the PRINTER INTERFACE BOARD.

Malfunctions of the PRINTER - Continued

Observed Condition: Character Density is not Horizontally Uniform on the Printout

To Check for Correct Operation: Execute Option 4 and check the printout for the original error condition. If the characters are correct, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The MOUNTING SCREWS on the PRINthead PLATEN are tightened excessively.	<ul style="list-style-type: none"> - Loosen the MOUNTING SCREWS and tighten them again until they are "finger tight". - If the characters remain very light, install a replacement for the PRINTER ASSEMBLY. - If the characters remain too light after a replacement for the PRINTER ASSEMBLY is installed, install a replacement for the PRINTER INTERFACE BOARD.

Malfunctions of the PRINTER - Continued

Observed Condition: Random Characters on the Printout — No Readable Text

To Check for Correct Operation: Execute Option 4 and check the printout for the original error condition. If the characters are correct, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The circuit for the PRINTER has a logic error.	- Press the MAIN POWER SWITCH to the "0" position, then to the "1" position, to reset the DT60 ANALYZER.
The CLM has the wrong language in the software program.	Obtain help from the Customer Support Center in Rochester. The telephone number is 800/921-0098.
The CLM is not seated correctly in SOCKET U7 on the CDM/CLM BOARD.	Remove and install the CLM on the CDM/CLM BOARD. Check that the CLM is seated correctly.
SOCKET U7 on the CDM/CLM BOARD is damaged.	Install a replacement for the CDM/CLM BOARD.
- The PINS in CONNECTOR J9 on the MOTHER BOARD or on the MASTER BOARD are damaged. - The PINS in SOCKET P9 on the CDM/CLM BOARD are damaged.	- Check the PINS in CONNECTOR J9 and in SOCKET P9 for damage. - Repair the PINS or install a replacement for the damaged BOARD as necessary.
The PRINTER INTERFACE BOARD is not seated correctly on the DRIVER BOARD or the MASTER BOARD.	Remove and install the PRINTER INTERFACE BOARD. Check that the BOARD is seated correctly.
The PRINTER INTERFACE BOARD has a malfunction.	Install a replacement for the PRINTER INTERFACE BOARD.

Malfunctions of the PRINTER - Continued

Observed Condition: No Visible Characters are Displayed on the Printout

To Check for Correct Operation: Execute Option 4 and check the printout for the original error condition. If the characters are correct, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The paper tape is installed in the reversed position. The surface of the paper toward the PRINthead is not correct.	To check that the paper is installed in the correct position, use a sharp point and make a scratch on the paper surface that is toward the PRINthead. If a mark is not visible, the tape is not installed correctly. Remove the paper tape and install it correctly. See "Paper Loading" in the Instrument Care and Cleaning section of the Operator's Manual.
The customer is not using the paper tape that is recommended by Kodak.	- Install THERMAL PAPER TL-3889 and execute Option 4. - Check the characters on the printout. If the characters are visible, recommend that the customer order paper tape made by Kodak or an equivalent style of thermal paper.
The CLM is not seated correctly in SOCKET U7 on the CDM/CLM BOARD. SOCKET U7 on the CDM/CLM BOARD is damaged.	Remove and install the CLM on the CDM/CLM BOARD. Check that the CLM is seated correctly. Install a replacement for the CDM/CLM BOARD.
- The PRINthead is damaged. - The TEFLON STRIP on the PRINthead PLATEN is loosened, bent, or not installed. - The PLATEN is damaged.	Install a replacement for the PRINTER ASSEMBLY.

Malfunctions of the PRINTER - Continued

Observed Condition: The Paper Tape Does Not Feed through the PRINTER

To Check for Correct Operation: Execute Option 4 and check the printout for the original error condition. If the characters are correct, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
The paper tape is not installed correctly.	Remove the paper tape and install it correctly. See "Paper Loading" in the Instrument Care and Cleaning section of the Operator's Manual.
The PRINTER ROLLER is not installed.	Install the PRINTER ROLLER.
The PRINTER ASSEMBLY has a paper jam.	<ul style="list-style-type: none"> - Check for and remove any particles of paper or dust. - If jams occur frequently, install a replacement for the PRINTER ASSEMBLY.
The CLM is not seated correctly in SOCKET U7 on the CDM/CLM BOARD.	Remove and install the CLM on the CDM/CLM BOARD. Check that the CLM is seated correctly.
SOCKET U7 on the CDM/CLM BOARD is damaged.	Install a replacement for the CDM/CLM BOARD.

Malfunctions of the PRINTER - Continued

Observed Condition: The PRINTER Does Not Operate — Error Code F18 Is Not Displayed

To Check for Correct Operation: Execute Option 4 and check that the PRINTER operates. If the characters are displayed correctly on the printout and Error Code F18 does not occur, this diagnostic is completed and the malfunction is repaired.

Possible Causes	Recommended Actions
CONNECTOR J34 for the PRINTER MOTOR is not seated correctly in the MOTHER BOARD or the MASTER BOARD.	Disconnect CONNECTOR J34 and connect it again, seating it correctly.
The PRINTER MOTOR has a malfunction.	Install a replacement for the PRINTER ASSEMBLY.
The logic circuit for the PRINTER MOTOR has a malfunction.	<p>Check that the PRINTER INTERFACE BOARD is seated correctly.</p> <p>For Multi-Board Configuration:</p> <ul style="list-style-type: none"> - Remove the DRIVER BOARD. - Remove the PRINTER INTERFACE BOARD from the DRIVER BOARD. - Check the PINS on the PRINTER INTERFACE BOARD and on the DRIVER BOARD for damage. - Repair the CONNECTORS, or install a replacement for the PRINTER INTERFACE BOARD or the DRIVER BOARD as necessary. - Install the PRINTER INTERFACE BOARD on the DRIVER BOARD. - Check the PINS on CONNECTORS J1 and J2 on the DRIVER BOARD for damage. - Check the PINS in CONNECTORS J5 and J6 on the MOTHER BOARD for damage. - Repair the CONNECTORS, or install a replacement for the DRIVER BOARD or the MOTHER BOARD as necessary. <p>For Single-Board Configuration:</p> <ul style="list-style-type: none"> - Remove the PRINTER INTERFACE BOARD from the MASTER BOARD. - Check the PINS on the PRINTER INTERFACE BOARD and on the MASTER BOARD for damage. - Repair the CONNECTORS, or install a replacement for the PRINTER INTERFACE BOARD or the MASTER BOARD as necessary. - Install the PRINTER INTERFACE BOARD.

Error Condition — Problems with Precision and Accuracy

Description

Accuracy Problems — The results of quality control tests are not within an acceptable range of the values indicated on the package for the control fluid. When quality control procedures are done as Kodak recommends, the test results from using control fluids should be within 2 standard deviations of the mean calculated by the customer for the last 10 quality control tests. A customer might have accuracy problems with only one chemistry, with a group of chemistries, or with all chemistries.

Precision Problems — The variation in the results for multiple readings of the same sample is not within the normal variation tolerance for the equipment. The problems with precision might occur for one chemistry, a group of chemistries, or all chemistries.

Diagnosing Problems with Precision or Accuracy

IMPORTANT

The customer should obtain assistance from the Clinical Products Customer Support Center in Rochester before a CES service call is made. The telephone number for customers in the U.S. and Canada is 800/521-0098.

- [1] Check that the customer has obtained help from the Clinical Products Support Center in Rochester.

Personnel in the Clinical Products Support Center or local Marketing personnel can provide help for the following causes of problems with precision and accuracy:

- The customer does not follow the correct procedures for calibration, quality control tests, or patient tests.
- The customer does not measure fluids correctly.
- The conditions in the site environment are not within the specifications for the equipment.
- The slides and fluids are not stored correctly.
- The customer uses slides, reference fluid, or calibration fluids with a lot number or generation number different from the lot numbers or generation numbers stored in the CDM.
- The test results obtained with the Kodak Ektachem DT SYSTEM are not the same as the results obtained with other equipment.

Using the Telephone for Diagnosing Problems with Precision or Accuracy

If the customer has made a telephone call to the Clinical Products Customer Support Center, a service call might be necessary. Before you go to the customer site, you can obtain information from the customer that will help you to diagnose a malfunction. It is important to know the results of processing new control fluids. Some chemistries are more sensitive than others to particular equipment malfunctions. These sensitive chemistries are also known as "marker" chemistries. For example, a chemistry that is sensitive to temperature malfunctions is a temperature "marker". The results of processing control fluids for "marker" chemistries might indicate special areas to begin diagnosing malfunctions. This section includes a table that lists chemistries and related areas of sensitivity, with "marker" chemistries identified.

Obtaining answers to the following questions should provide a direction for diagnosing the cause of a problem with precision or accuracy.

- Is the problem with patient samples, with control fluids, or with both? If the problem is with patient samples only, the customer should process tests using control fluid. If the problem is with controls only, or with both, ask the customer to check that the correct published ranges are being used. The values change with different lot numbers and from manufacturer to manufacturer.
- Are the results too high or too low?
- Did the change in the results occur suddenly or gradually?
- Is anything being done differently from the normal conditions?
- Are control fluids being processed?
- When were the control fluids mixed and how were they stored?
- Are the control fluids from Kodak or from an OEM?
- When were the control fluids last processed?

IMPORTANT

If new control fluids have not been processed within 7 days, or according to recommendations from the CPD Customer Support Center, the customer should process control fluids for all chemistries now in stock at the site. New control fluids should be mixed for the processing.

- Are the results within the ranges indicated by Kodak or the OEM?
 - Are the results being compared correctly with the ranges provided with the new control fluids? Occasionally customers use old ranges for comparison with the results from processing new control fluids.
- [2] When you know that new control fluids have been processed, ask the customer:
- Which chemistries **do not** provide successful results?
 - Which chemistries **do** provide successful results?
 - Which additional chemistries **are available** at the customer site?
- [3] If the customer did not make a telephone call to the Customer Support Center, ask the customer about **how the control fluids were mixed**:
- Was the volume in each bottle correct?
 - What measuring tool was used? A volumetric pipette should be used, and it should have been cleaned correctly before using.
 - Was the fluid mixed automatically on a ROTATOR, or manually? If the fluid was mixed manually, the bottle should have been rotated to the top down position at 5 minute intervals for 30 minutes.
 - How were the control fluids stored before and after mixing?
 - Were the control fluids stored for the correct amount of time before and after mixing?
- [4] The customer might process another lot of control fluids to check the results of the first processing. Ask the customer:
- Are the results the same after processing both lots of control fluids? If not, how were the results different?
- [5] Check again:
- Which chemistries **do not** provide successful results?
 - Which chemistries **do** provide successful results?

- [6] See the Chemistry Sensitivities Table at the end of this diagnostic procedure.
You can ask the customer to check some items for equipment malfunction before you go to the site. If the "marker" chemistries indicate problems with:

Temperature and Humidity

For chemistries that are sensitive to variations in temperature and humidity, ask the customer to check:

- The temperature and humidity conditions at the site are within the site specifications for the correct operation of the equipment.
- The SCREWS that hold the MAIN COVERS are installed and tightened correctly.
- The SLIDE DISPOSAL BOXES are installed correctly.
- The FANS operate correctly and are not dirty.

- [7] If a service call is necessary, use the Service Call Diagnostic Checklist for Precision and Accuracy together with the Chemistry Sensitivities Table.

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Precision and Accuracy — Service Call Diagnostic Checklist

HARDWARE — Optics

- Do the D₀ Procedure.
- Check the condition of the FORS HEAD and the WHITE REFERENCE TARGET in the DT60 ANALYZER.
- Check the SAPPHIRE WINDOW and the WHITE REFERENCE SPOT in the DTSC MODULE, and if necessary, clean each with alcohol.
- Check the calculation of the gains for the DTSC MODULE.

Hardware — Metering

- Do the checkout procedure for the Kodak Ektachem DT PIPETTE. See the Adjustments and Special Procedures for the DT60 ANALYZER, section 8 in this service manual.
- Check that the customer uses the TIPS made by Kodak. Check that the TIPS do not have obstructions. Check that the customer does not install the TIPS manually. The PIPETTE HOLDER should be used to hold the TIPS for installation on the PIPETTES.
- Check the operator technique for the Kodak Ektachem DT PIPETTE and the Kodak Ektachem DTE PIPETTE. See "Pipetting Techniques" in the Operating Instructions section of the Operator's Manual.
- Install and fill the DUAL-SAMPLE CUP. Use control fluid in the large WELL and reference fluid in the small WELL. Move the SAMPLE HOLDER into the closed position. Use the DTE PIPETTE to aspirate the fluids.

Hardware — Temperature

- Check that the FAN in each module operates correctly.
- Check the condition of the TRACK, the INCUBATOR including the UPPER INCUBATOR CHAMBER, and the FORS WEIGHT ASSEMBLY in the DT60 ANALYZER.
- Check that the PREHEAT ARM, the READ ARM, and the SLIDER CAM in the DTSC MODULE operate correctly.

Hardware — ELECTROMETER

- Check the CONTACT MARKS, or "footprint", on used potentiometric slides.
- Do the Contact Verification Test. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.
- Check the Compression Adjustment for the ELECTROMETER CONTACTS. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.
- Check that the BOOT is seated correctly on the DTE MODULE. Is the BOOT a vented style?
- Do the Reference and Offset Test. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.
- Do the Bias Current Test. See the Adjustments and Special Procedures for the DTE MODULE, section 9 in this service manual.

Materials

- Are the lot numbers stored in the memory correct for the slides and other materials that are being used?
- Check with the Marketing organization (Customer Support Center in Rochester) for any new information about individual chemistries.
- Check that the reference fluid has been stored correctly. An opened bottle should not have been stored for an excessive time.
- Check that the customer has the correct CALIBRATORS. For example, Kit 4 and Kit 4 Plus should not be interchanged.
- Check that the control fluids are correct.

Operator Protocol

- Check that the slides, CALIBRATORS, and control fluids have been stored correctly.
- Check that the site is within specifications for the equipment and the materials.
- On the DTE MODULE, check that the WELLS in the DUAL-SAMPLE CUP are filled correctly and the RESERVOIR HOLDER is in the closed position before aspirating the fluids.
- Check that the fluids in the DUAL-SAMPLE CUP do not have air bubbles.
- Check that the bottle of reference fluid does not have dried fluid or "crust".
- Check that the sample fluid did not remain in the DUAL-SAMPLE CUP for an excessive time. The recommended time is < 5 minutes.
- Check that the PIPETTES are used correctly during the metering operation.

IMPORTANT

When the sample and reference fluids are aspirated, the DTE PIPETTE should be inserted through the ASPIRATING STATION PIPETTE HOLDER and the RESERVOIR HOLDER should be in the closed position.

- Check that the CALIBRATORS and the control fluids were prepared correctly. See "Preparing the CALIBRATORS" in the Calibration section of the Operator's Manual.
 - 3.0 mL of the Bottle 1 diluent should be transferred to the Bottle 1 lyophilized CALIBRATOR.
 - Lot numbers should match on all bottles of the CALIBRATORS.
 - The bottles should be rotated gently to mix the fluids.
 - The bottles should be placed in the refrigerator after the fluids are mixed.
 - The fluids should not be contaminated.
- Check that the lot number on the "control sheet" matches the lot number for the controls used by the customer.
- Check that the slides are handled correctly. Slides should be used as soon as the individual package is opened. Slides should not remain at room temperature for an excessive time.
- If the DTSC MODULE has been energized for a long time, a new gain calculation might be necessary.
- Check that cleaning materials used on or adjacent to the equipment do not cause contamination of the chemistries. NH₃ is very sensitive to contamination by gases.
- Check the operator technique for slide insertion. If the slide is inserted with excessive force, the slide might not be aligned correctly with the SPOTTING STATION in the DT60 ANALYZER.
- The customer technique for obtaining patient samples might cause test results that are not correct. Obtain information or help from the Marketing organization (Customer Support Center in Rochester) if necessary.

CAUTION

Use slides within 15 minutes
after opening the package.

Chemistry Sensitivities – for Diagnosing Problems with Precision and Accuracy

		OPTICS													METERING					SITE		OPERATOR							
		Slide Reading System							Correction Factors						LAMP - Spike DTSC MODULE	ELECTROMETER - Malfunction	Drop Volume	PIPETTE - "Dwell"	TIP - Height Adjustment	"Pre-Spot"	Drop Centaring	INCUBATOR - Temperature	Temperature	Humidity	Fluid not prepared correctly	Fluid exposed to light	TIP not wiped	Slide exposed to light	Fluid exposed to air
		DT60 ANALYZER FORS - LEDs			DTSC MODULE FILTERS				Green LED		Yellow LED		Red LED																
		Green 555 nm	Yellow 605 nm	Red 660nm	340 nm	400 nm	480 nm	680 nm	White	Black	White	Black	White	Black															
Chemistries	AMYL	X																X	X	X		X			X			AMYL	
	CHOL	X								X																+ bias		CHOL	
	GLU	X																				X						GLU	
	Hb	X																					X					Hb	
	TBIL	X							X												X			X	X		X	TBIL	
	TP	X																X							X			TP	
	TRIG	X								X							X	X										TRIG	
	CREA		X								X	X								X	X	X					X	CREA	
	NH3		X								X	X								X	X	X					X	NH3	
	BUN/UREA			X										X						X		X				- bias		BUN/UREA	
	URIC			X										X*												+ bias		URIC	
	HDLC			X														X					X					HDLC	
	PHOS			X																								PHOS	
	Mg			X																								Mg	
Colorimetric DTSC MODULE	Theo					X								X			X	X						X				Theo	
	Ca						X							X													X	Ca	
	CRSC						X																					CRSC	
Rate, DTSC MODULE	AST				X										xx**	xx			X				X			X		AST	
	ALT				X										X				X				X			X		ALT	
	LDH				X																		X			X		LDH	
	GGT					X																	X					GGT	
	ALKP					X									X				X				X					ALKP	
	CK							X															xx	X		X		CK	
	CKMB						X																					CKMB	
Potentiometric DTE MODULE	K+														xxx						X	X						K+	
	Na+														xx						X	X						Na+	
	CO2														X	X									X		X	CO2	
	Cl-																											Cl-	

* Reconstitution will correct, unless outside spline range errors occur.

** Especially sensitive at values > 100.

DIAG1.TXT and 3100SM_Q.TXT
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Customer Equipment Services

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Kodak Ektachem DT60 ANALYZER

Diagrams

Section 6

PLEASE NOTE

The information contained herein is based on the experience and knowledge relating to the subject matter gained by Eastman Kodak Company prior to publication.

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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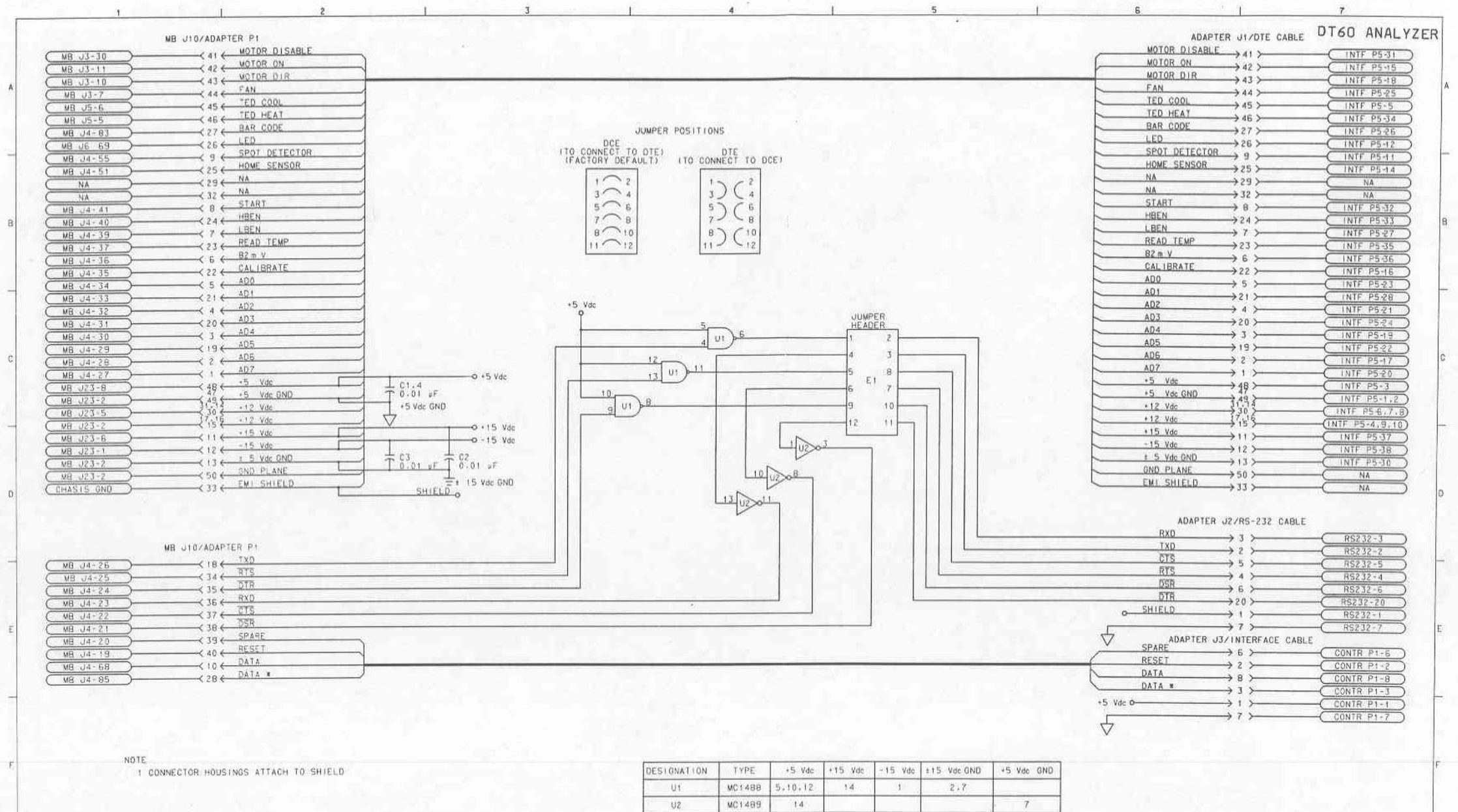


Figure 1 ADAPTER BOARD - V10.7 and V11.0 Software

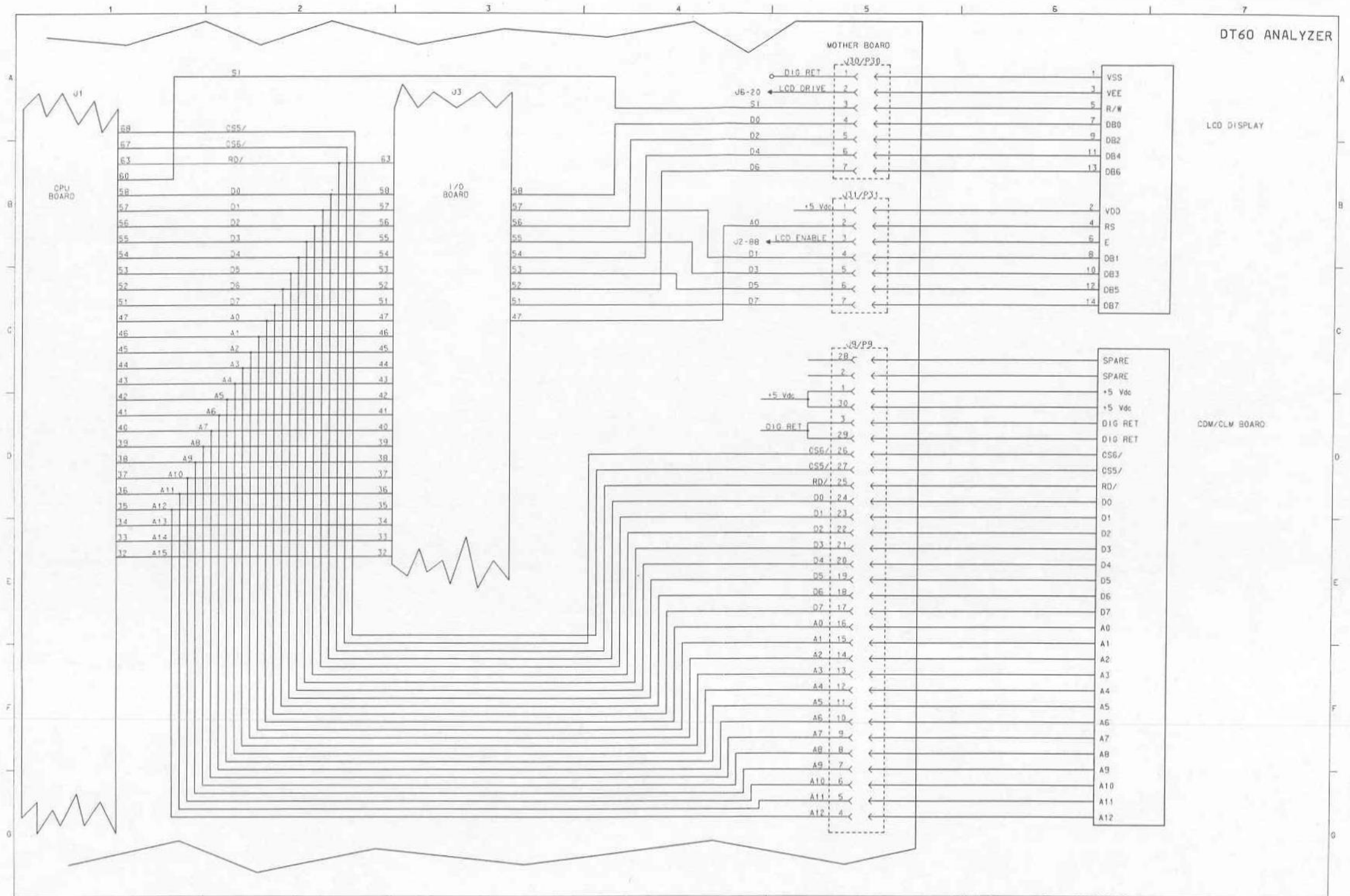


Figure 2 Interconnect - LC DISPLAY, CDM/CLM BOARD - V9.0 Software

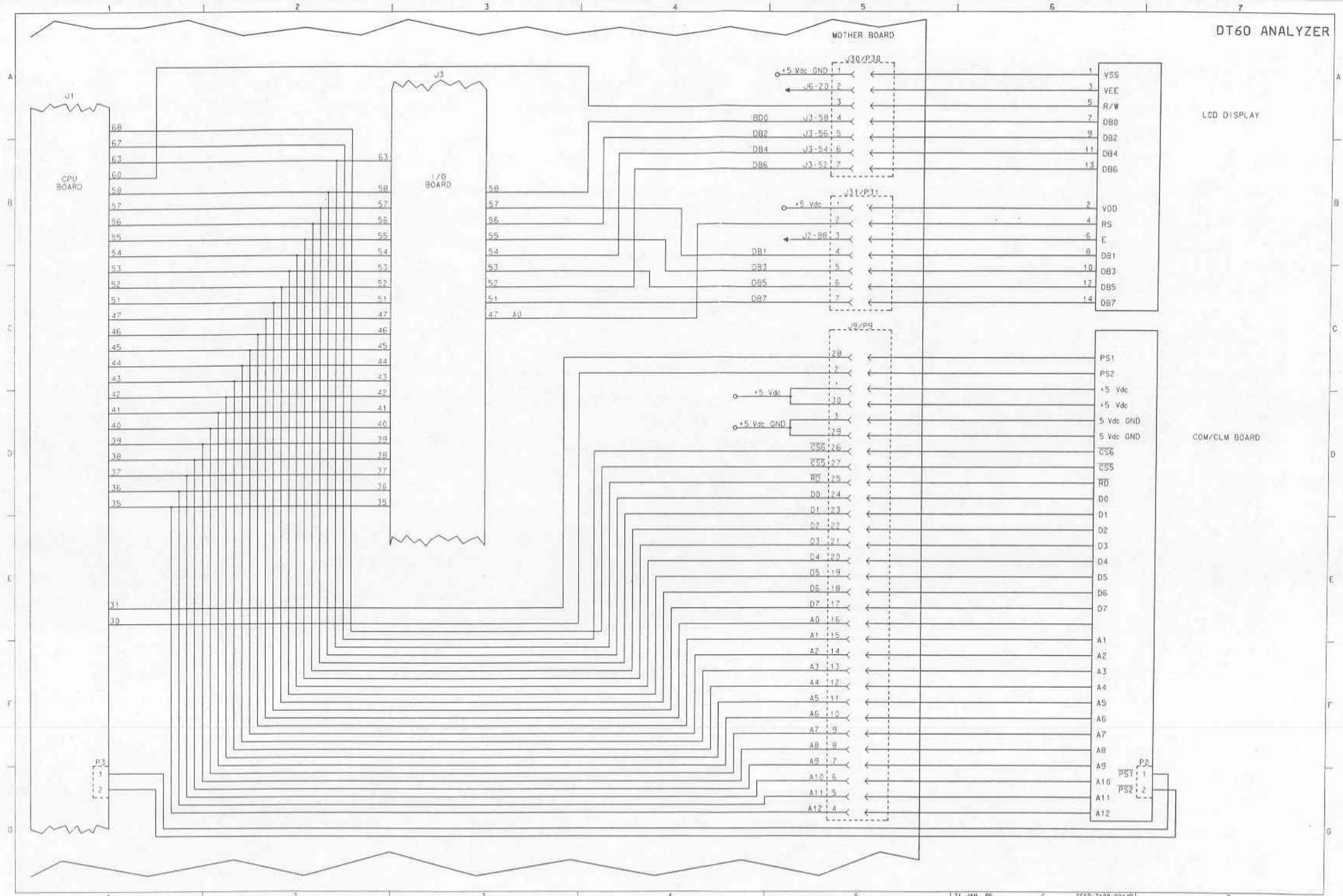


Figure 3 Interconnect- LC DISPLAY, CDM/CLM BOARD - V10.7 and V11.0 Software

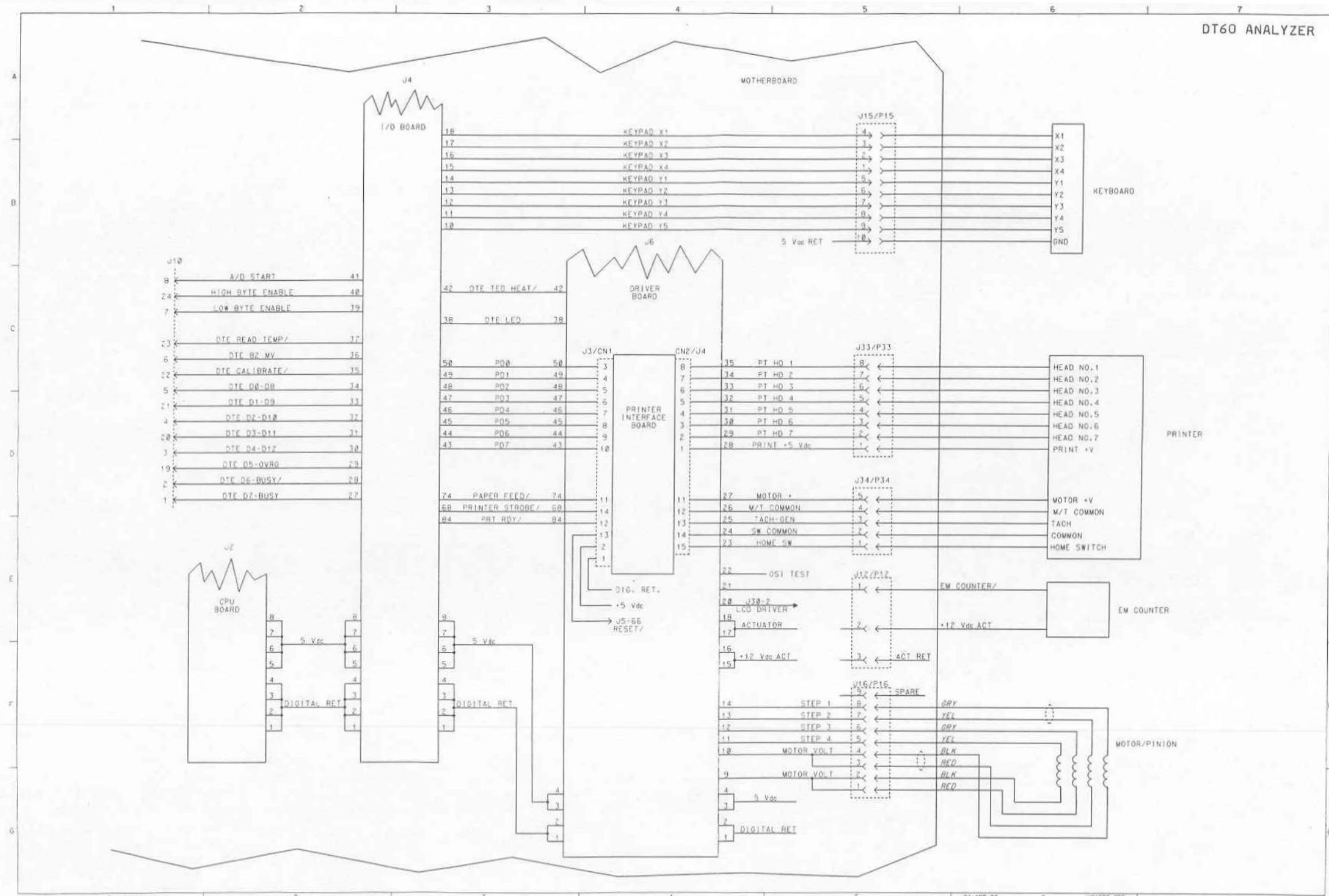


Figure 4 Interconnect - KEYBOARD, PRINTER, ACTUATION COUNTER, MOTOR and PINION ASSEMBLY

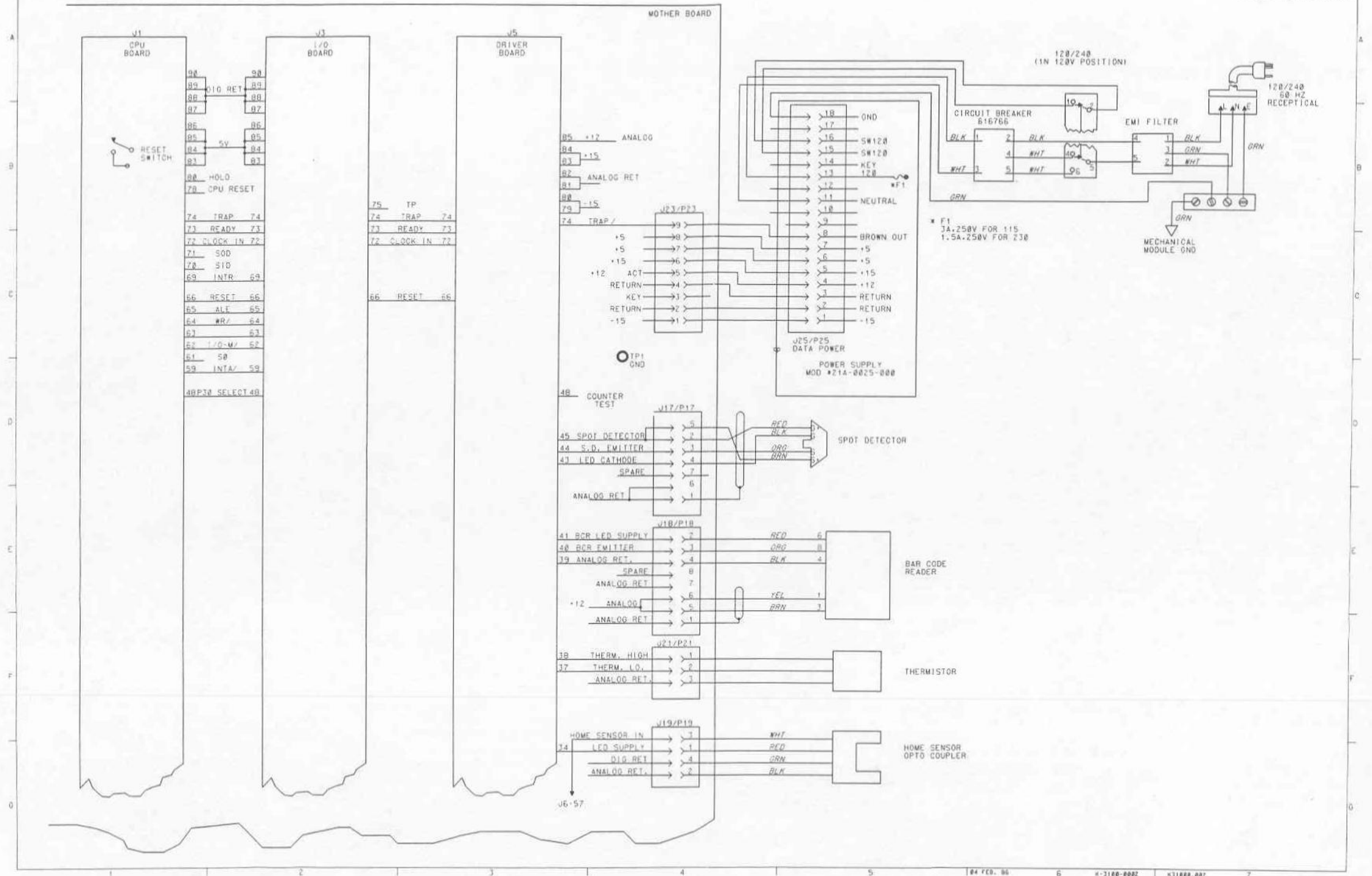


Figure 5 Interconnect - POWER DISTRIBUTION, SPOT DETECTOR, BAR CODE READER, THERMISTOR and HOME SENSOR

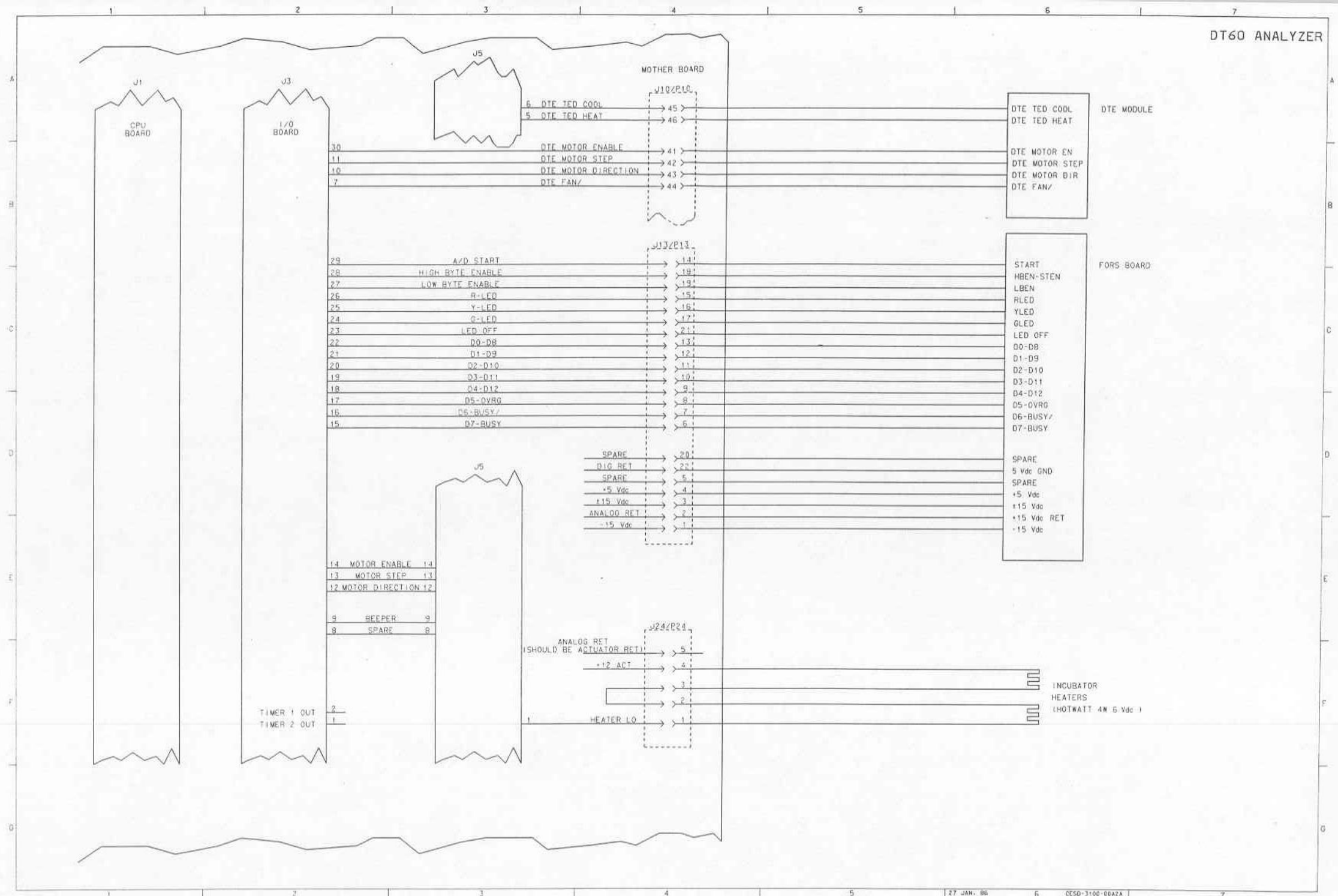


Figure 6 Interconnect - FORS ASSEMBLY, INCUBATOR HEATER, HEAT PUMP for DTE MODULE

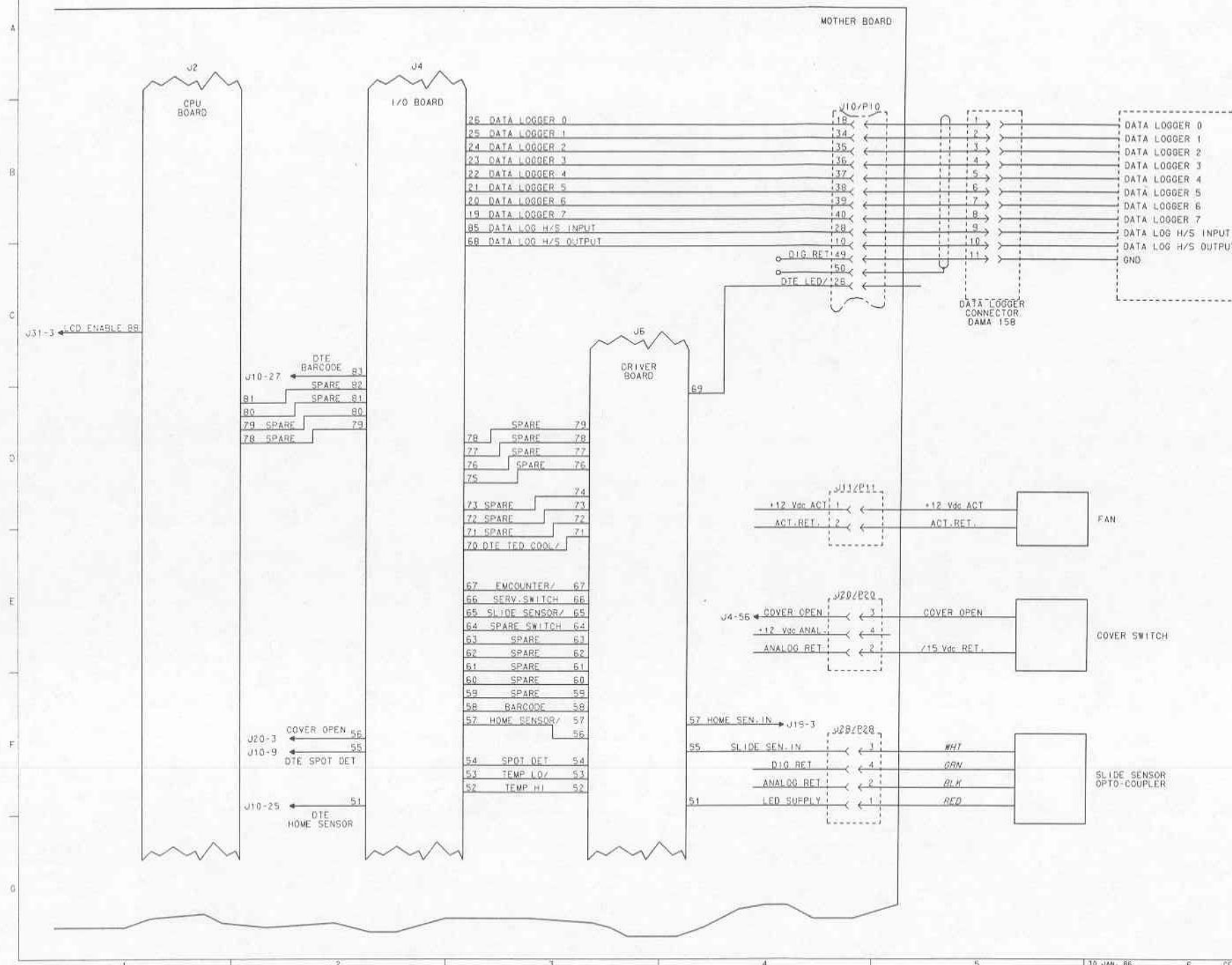
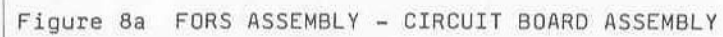


Figure 7 Interconnect - FAN, COVER SWITCH, SLIDE SENSOR and DATA LOGGER



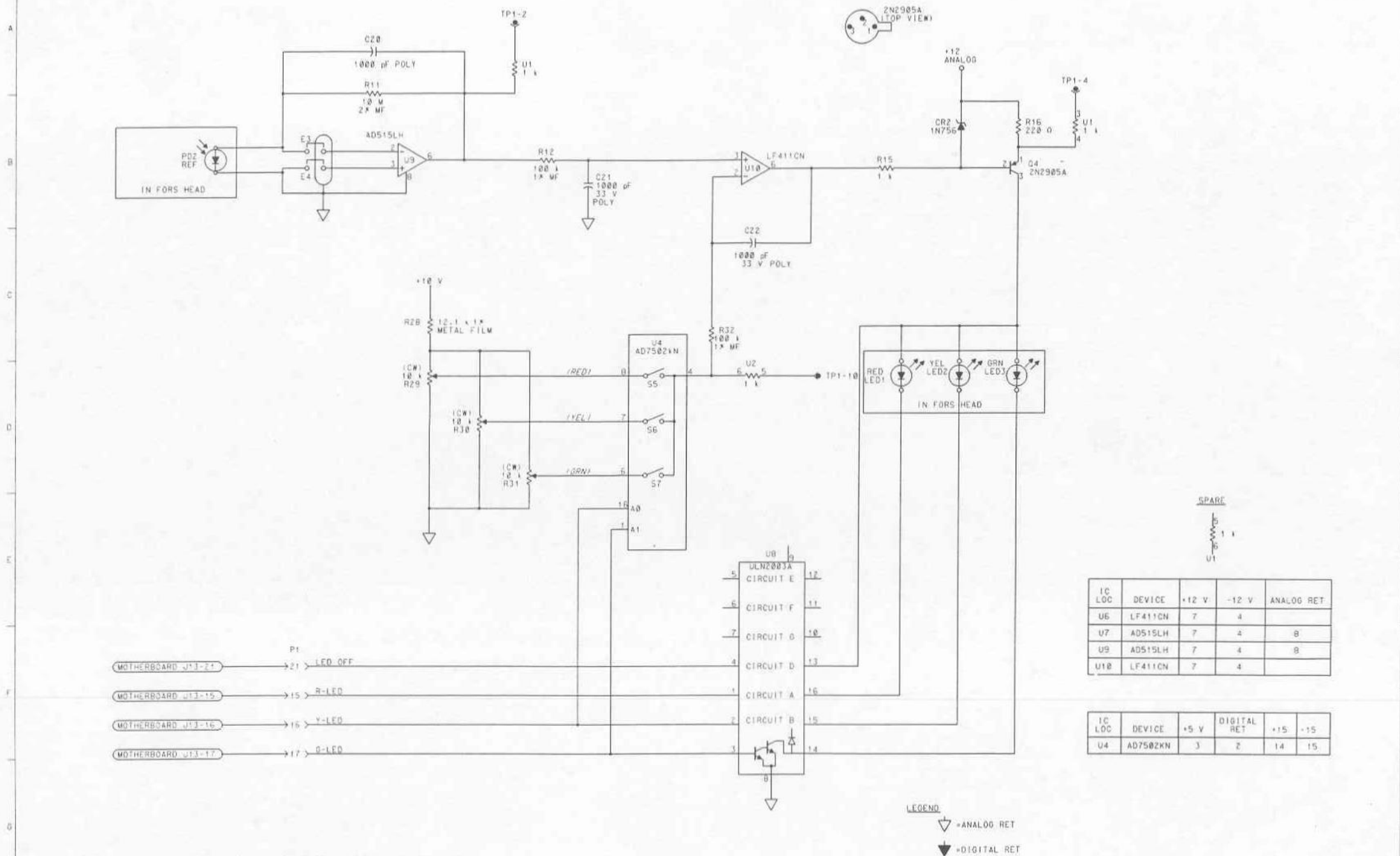


Figure 8b FORS ASSEMBLY - CIRCUIT BOARD ASSEMBLY



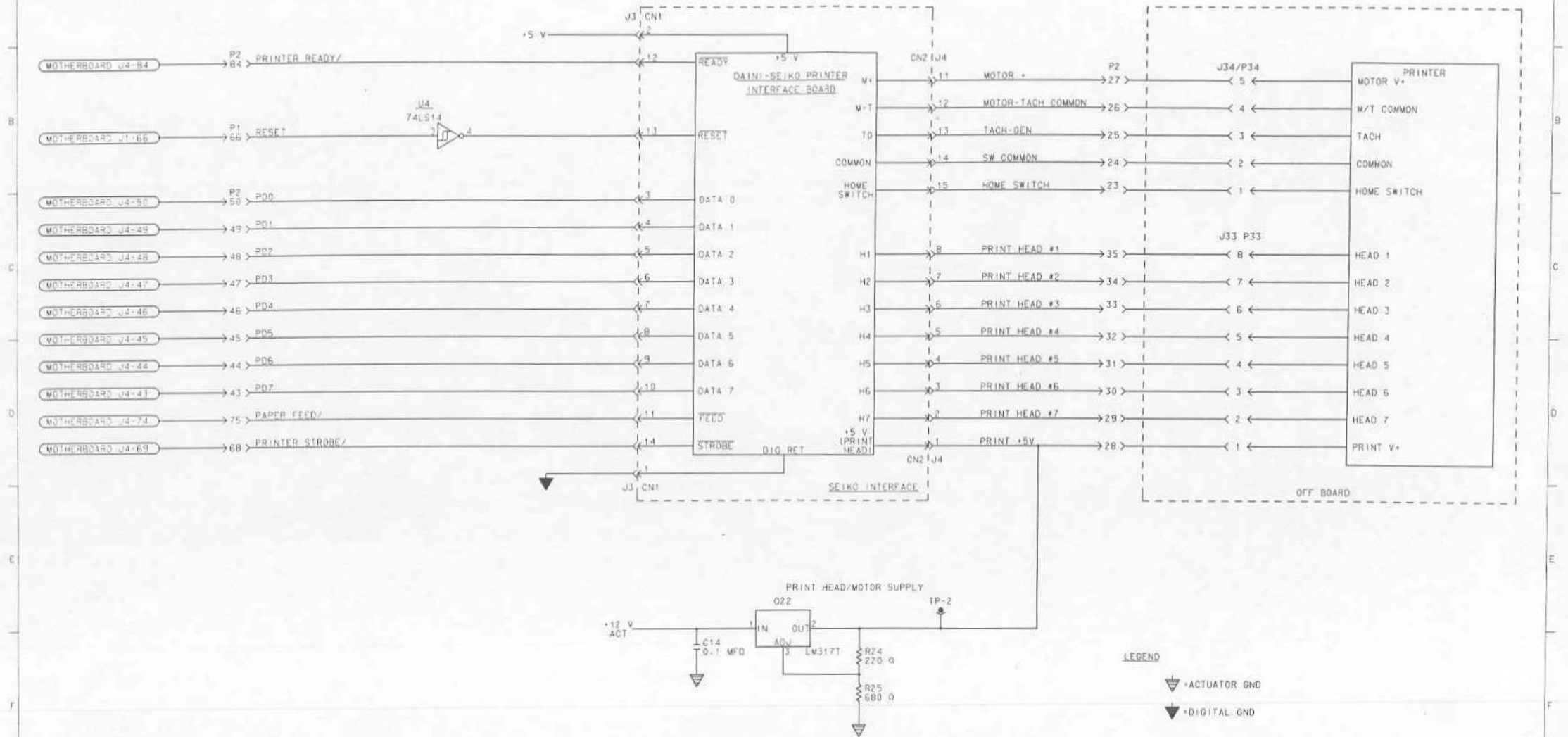


Figure 10 DRIVER BOARD - PRINTER INTERFACE

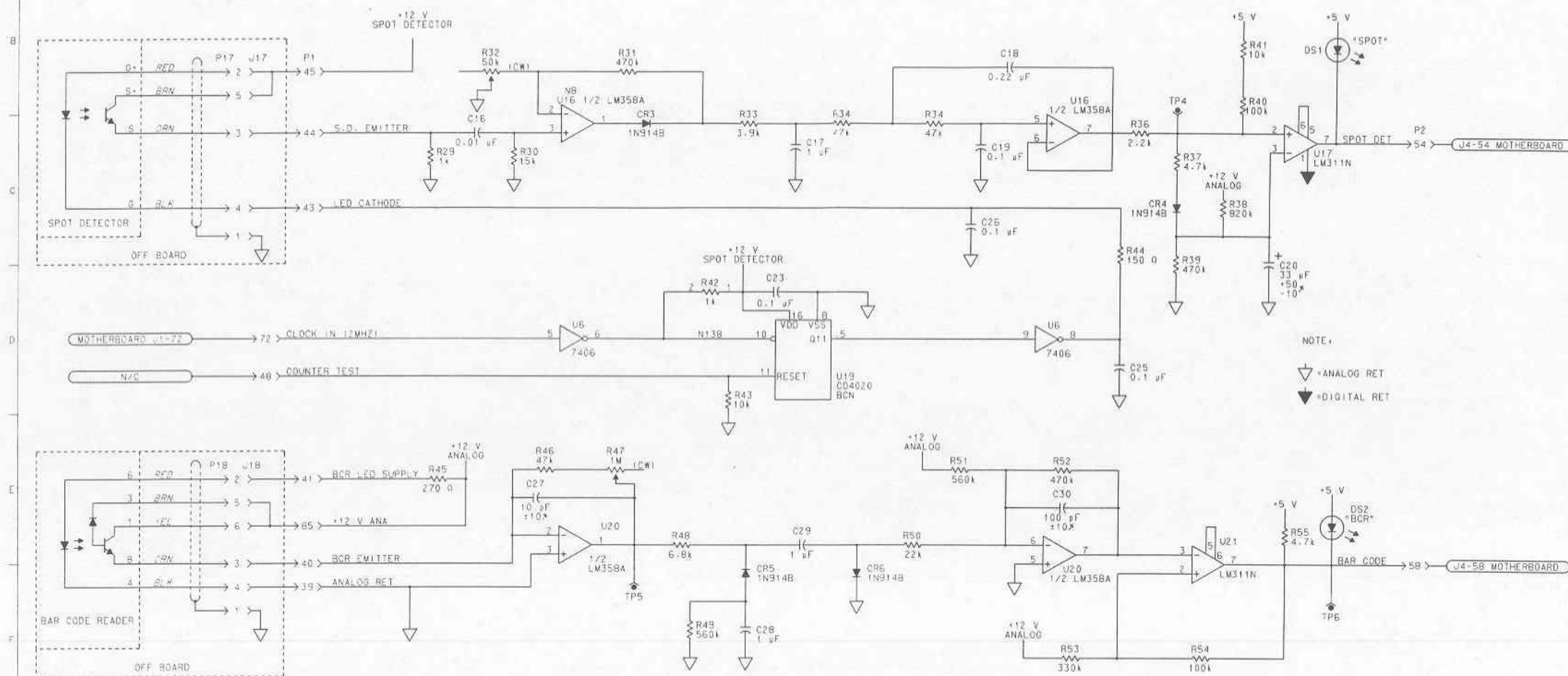
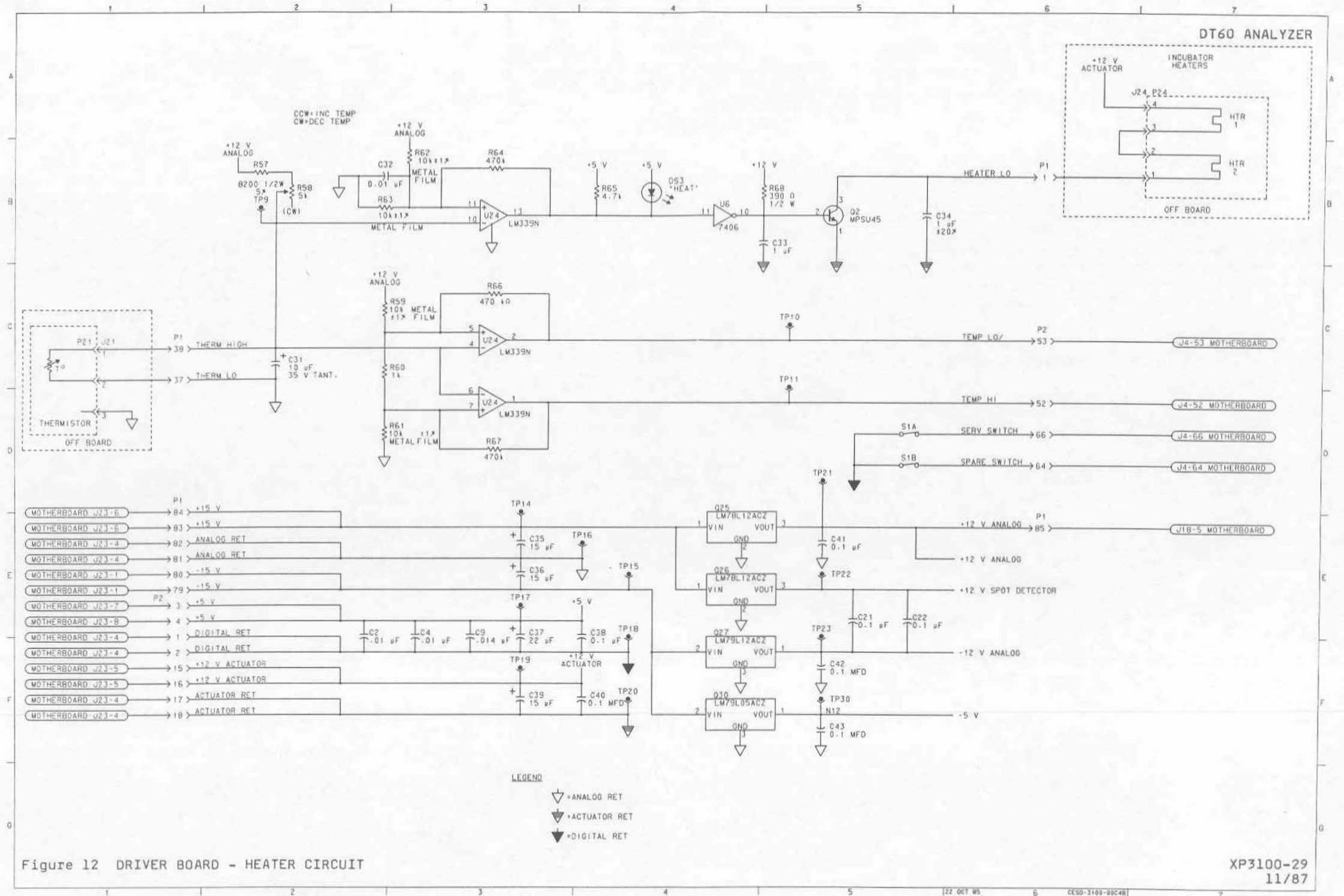


Figure 11 DRIVER BOARD - SPOT DETECTOR
and BAR CODE READER



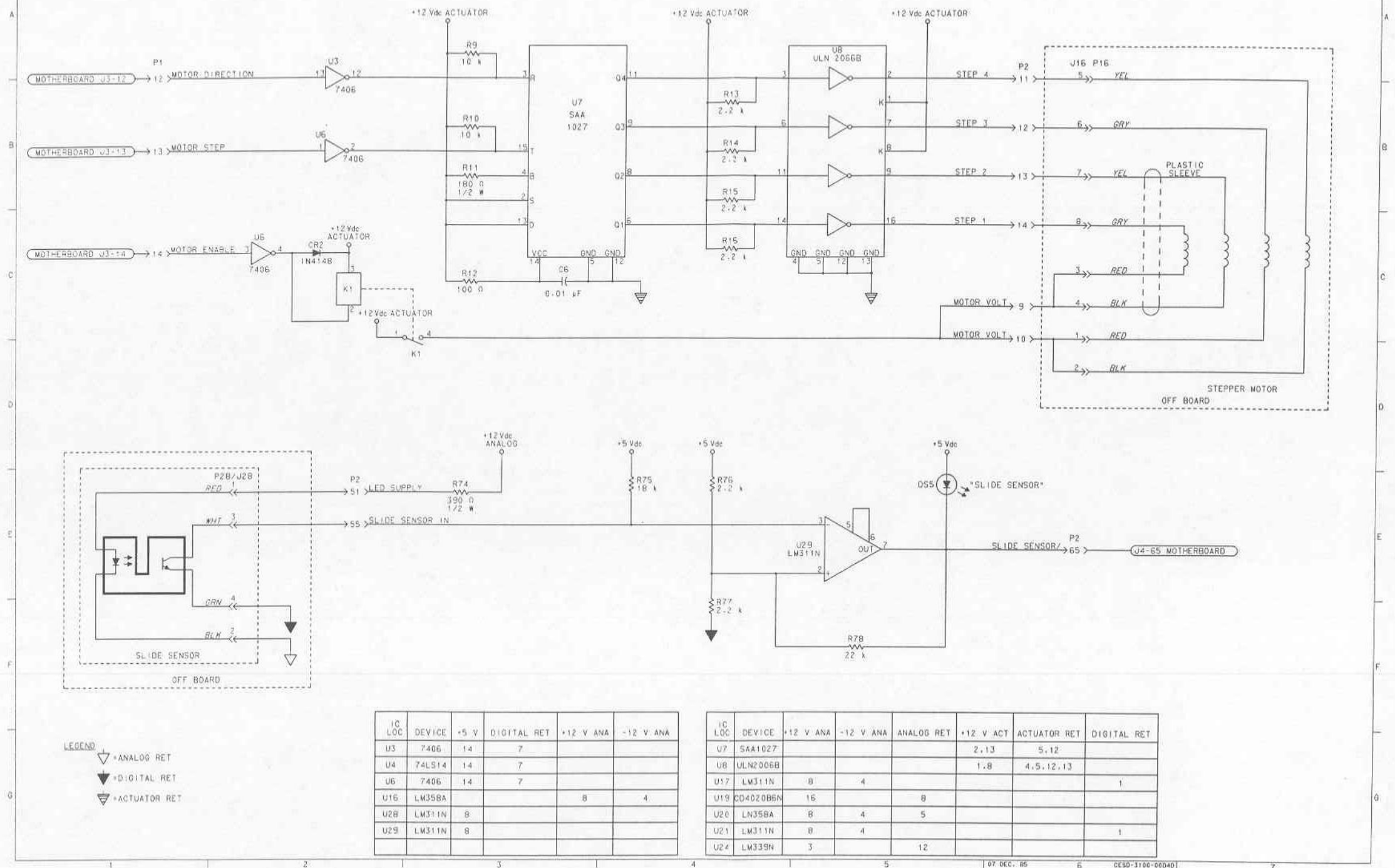


Figure 13 DRIVER BOARD - STEPPER MOTOR CIRCUIT

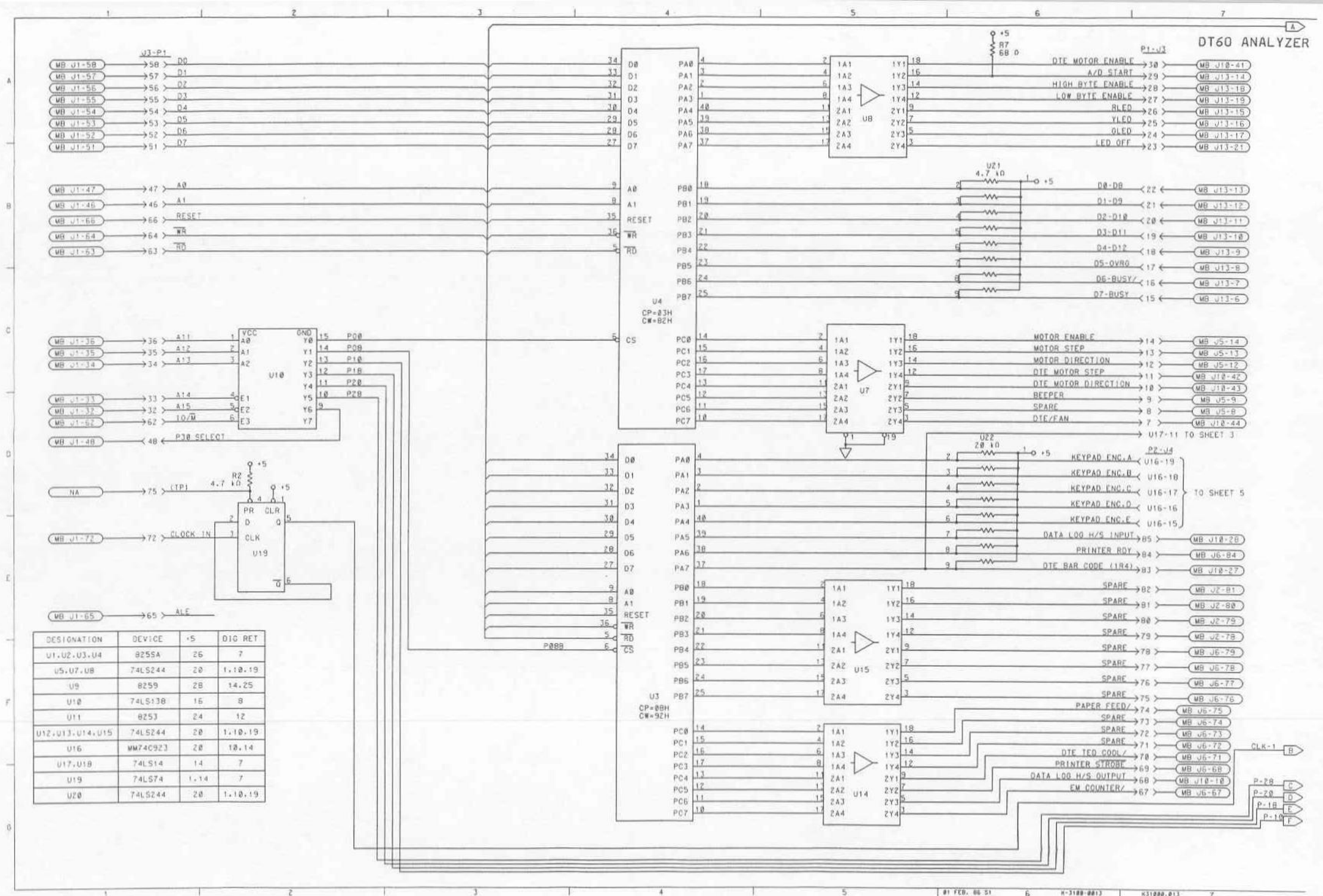


Figure 14a I/O BOARD - V9.0 Software

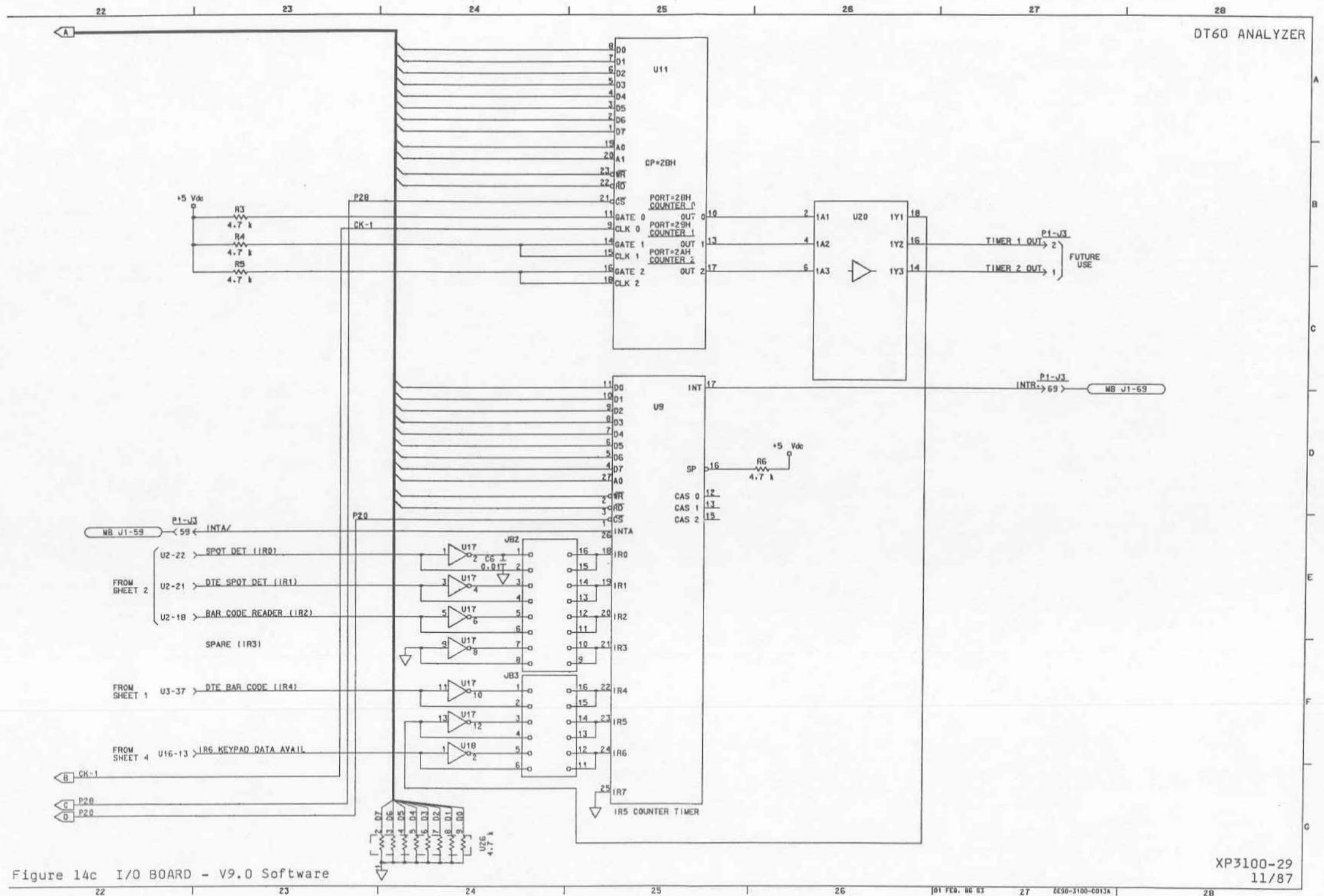


Figure 14c I/O BOARD - V9.0 Software



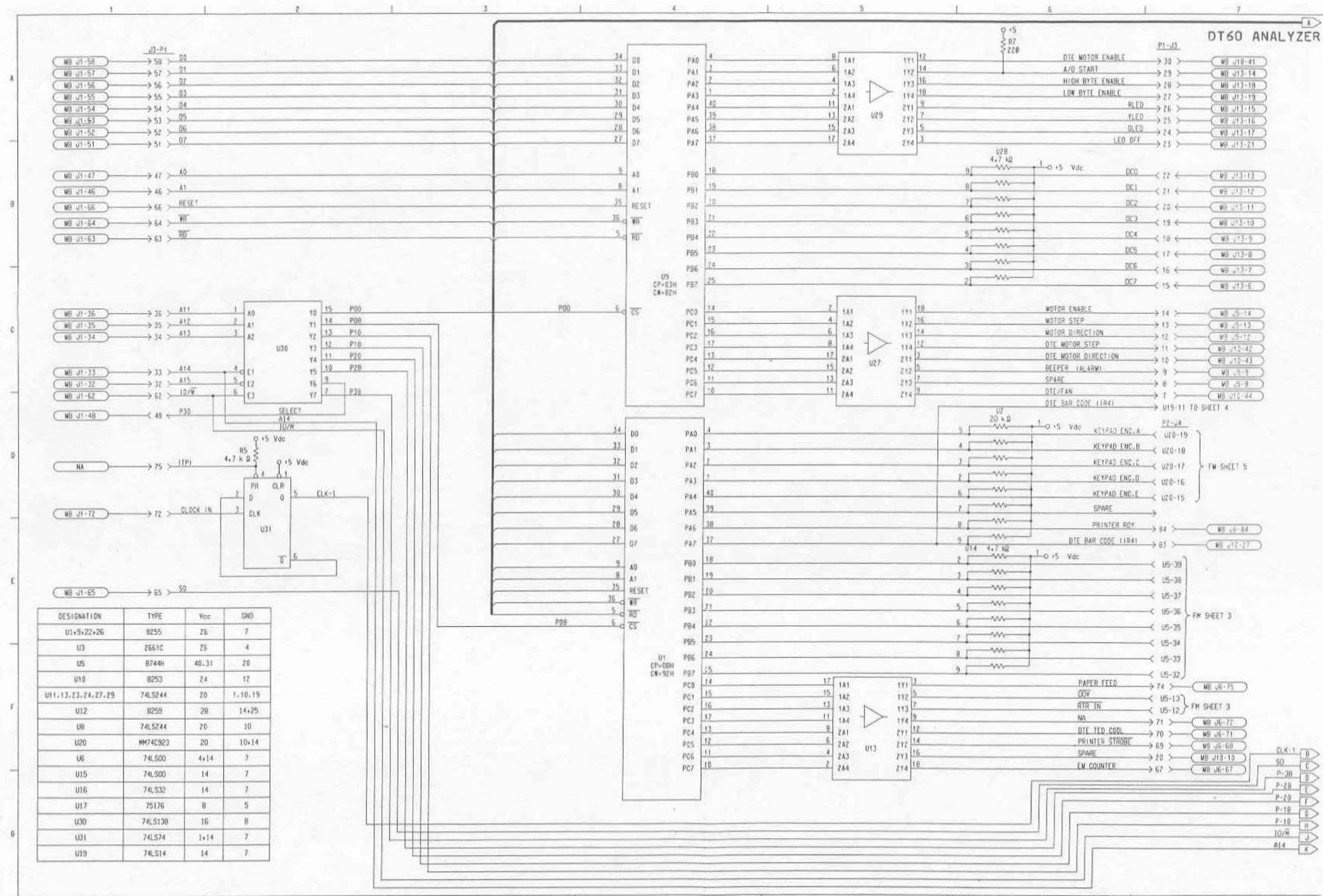


Figure 15a I/O BOARD - Version 10.7 and Version 11.0 Software

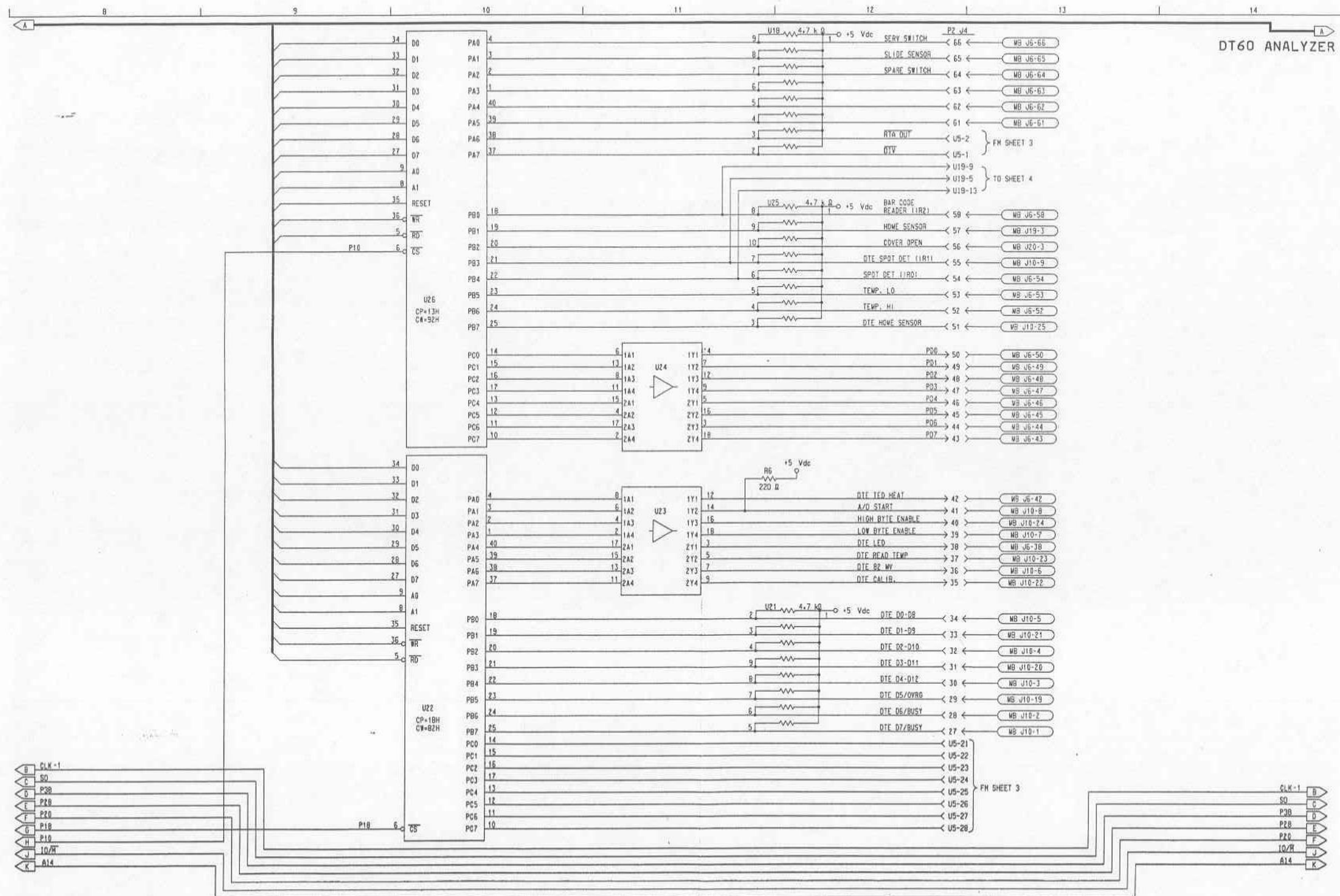


Figure 15b I/O BOARD - Version 10.7 and Version 11.0 Software

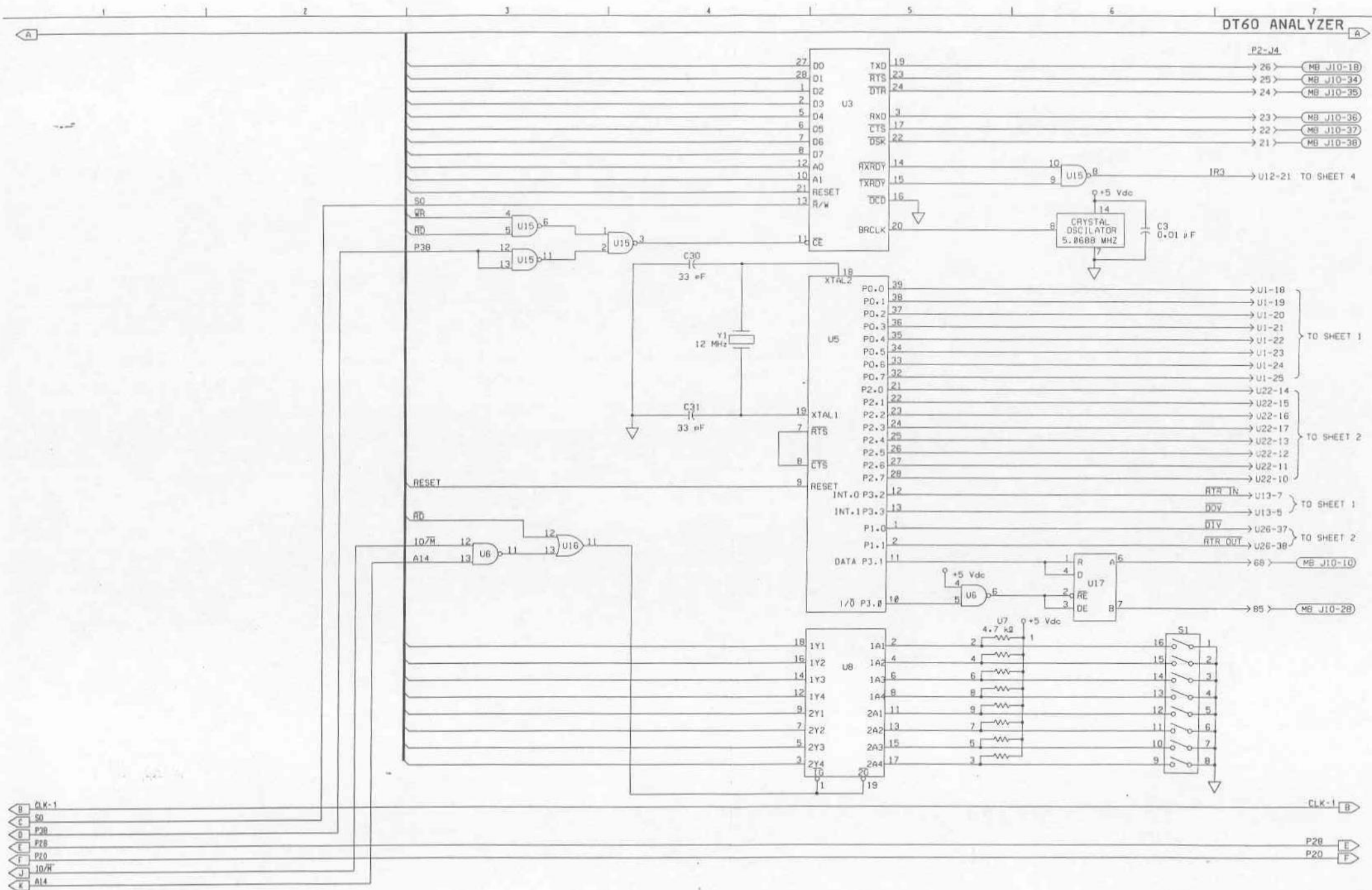


Figure 15c I/O BOARD - Version 10.7 and Version 11.0 Software

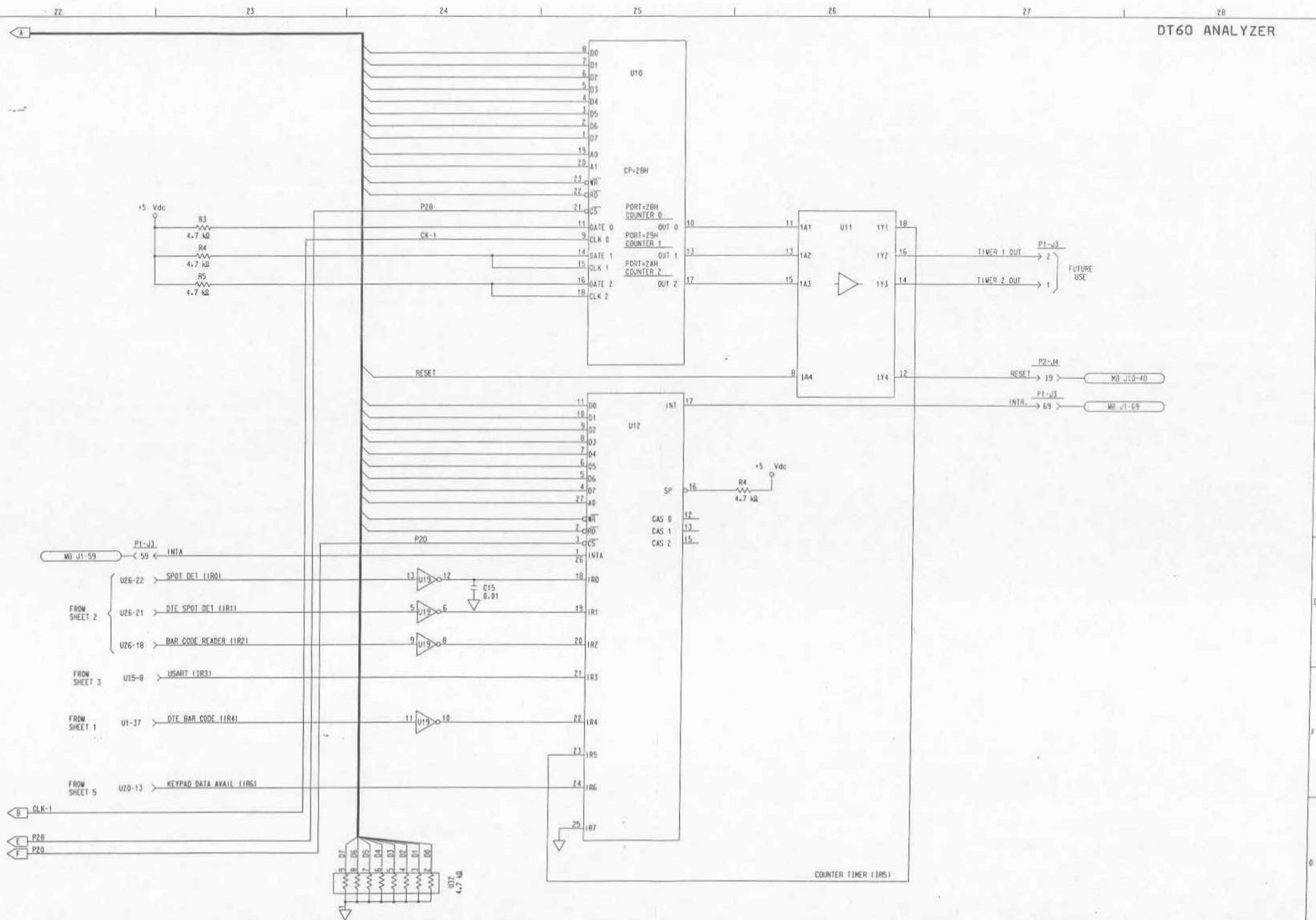
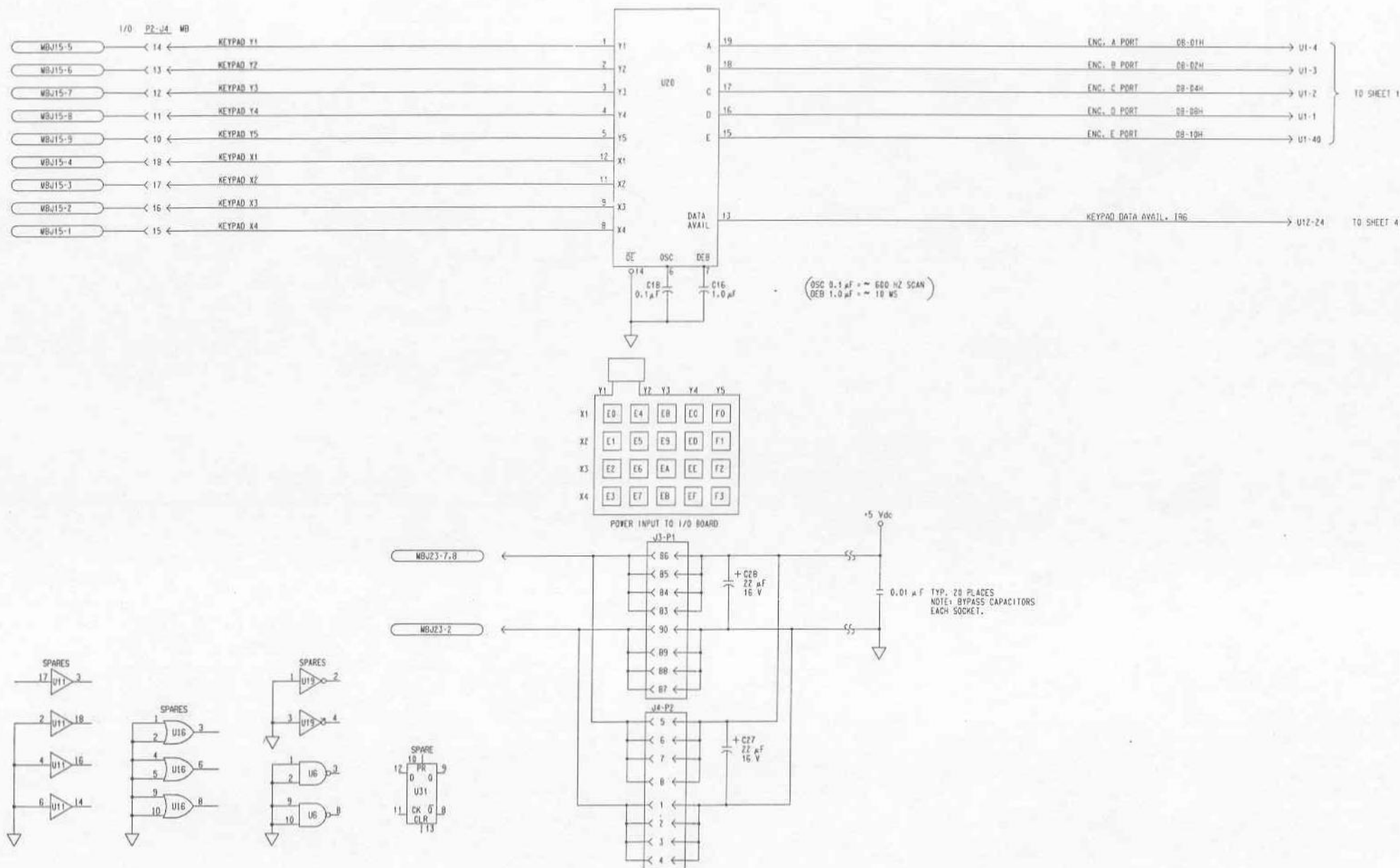


Figure 15d I/O BOARD - Version 10.7 and Version 11.0 Software



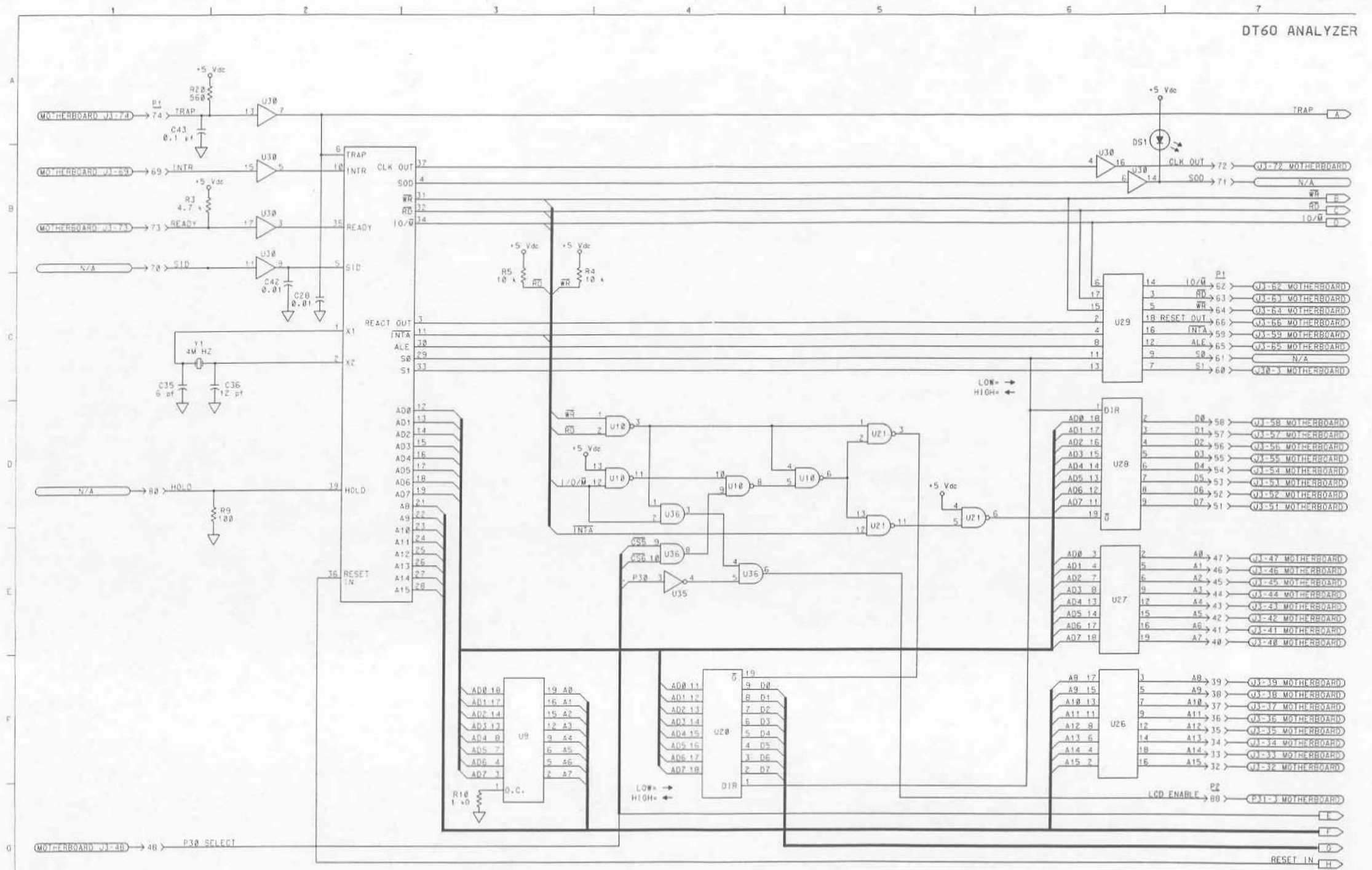
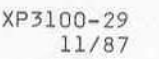


Figure 16a CPU BOARD - V9.0 software



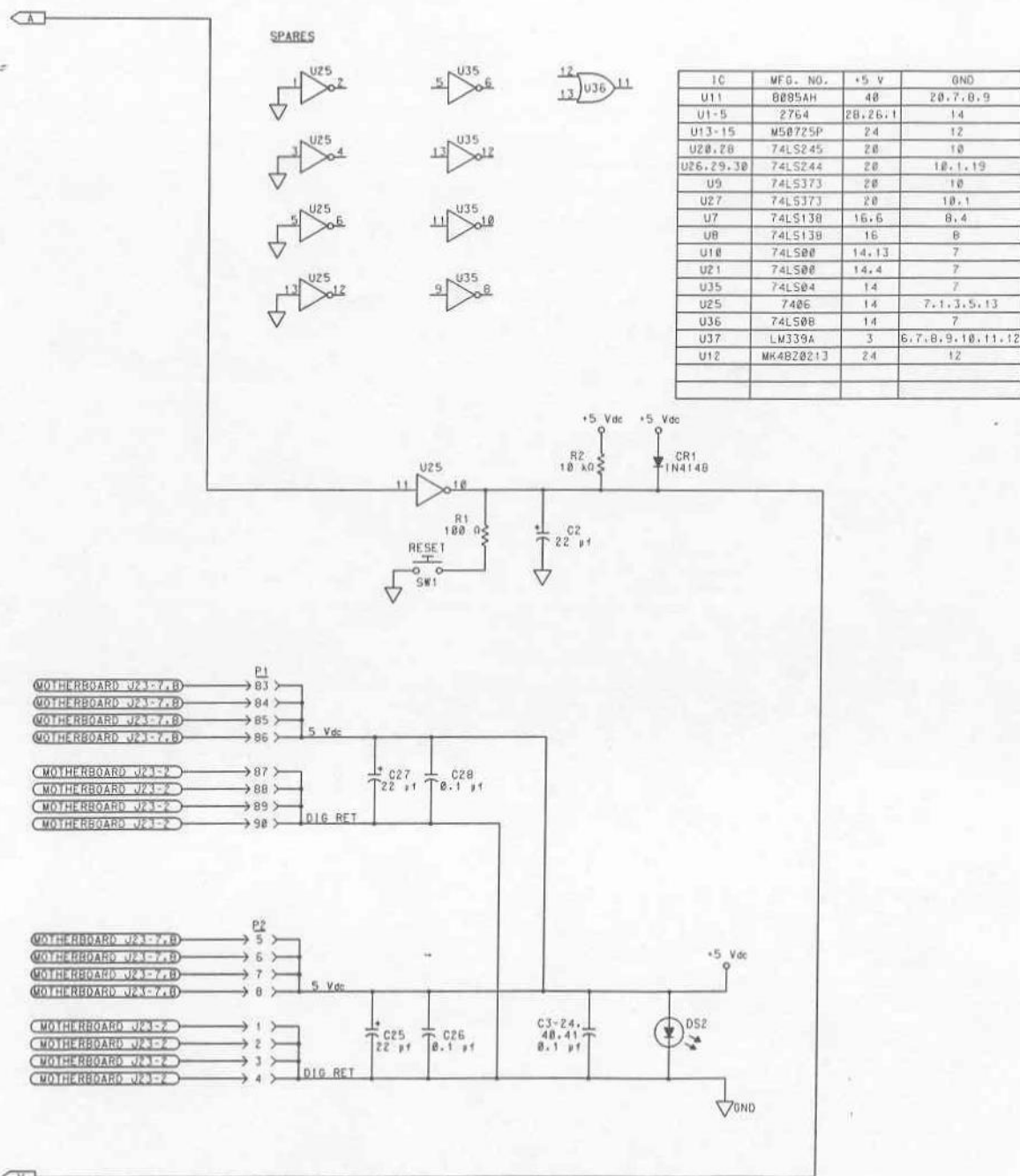
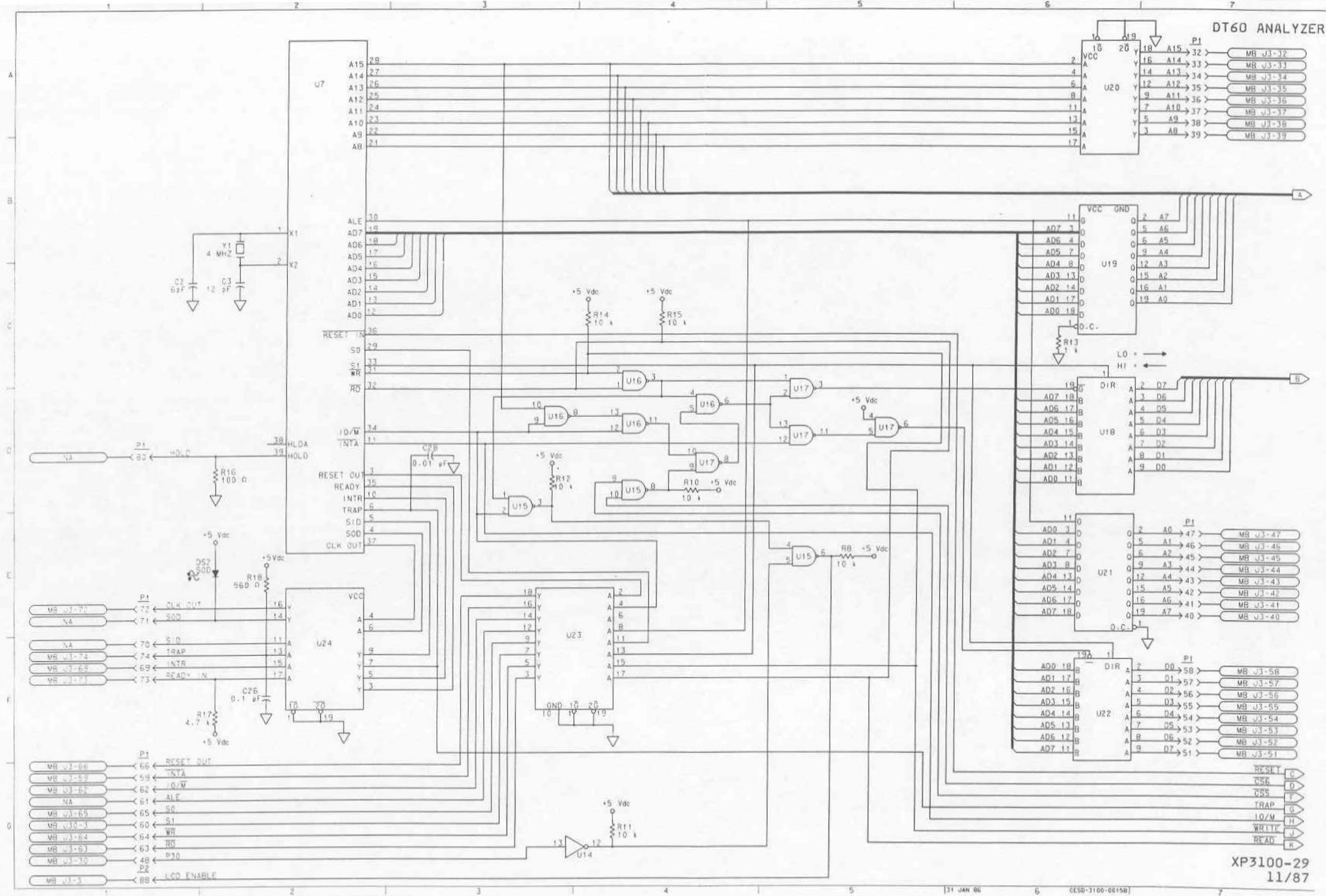
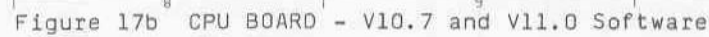
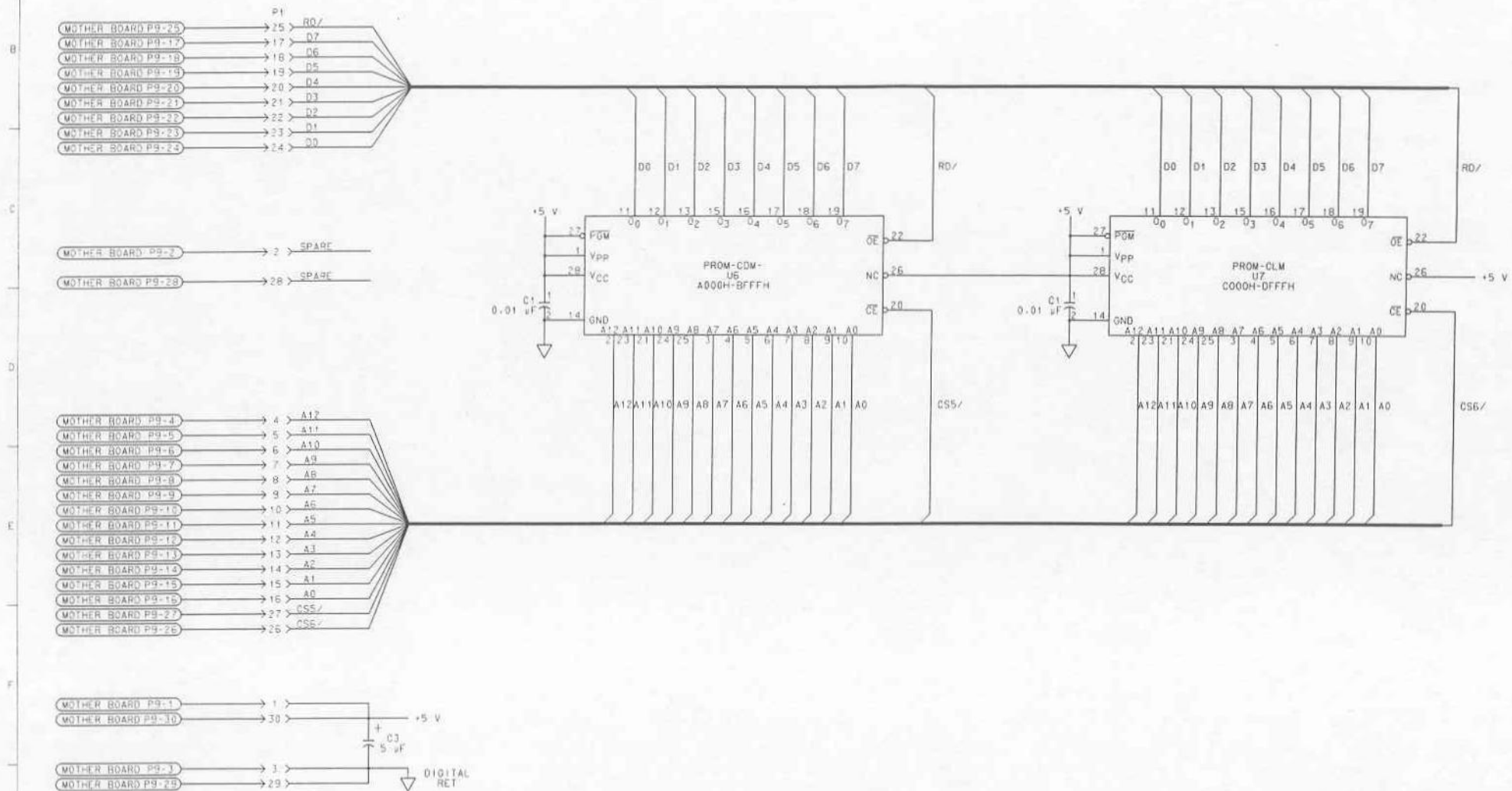


Figure 16c CPU BOARD - V9.0 Software







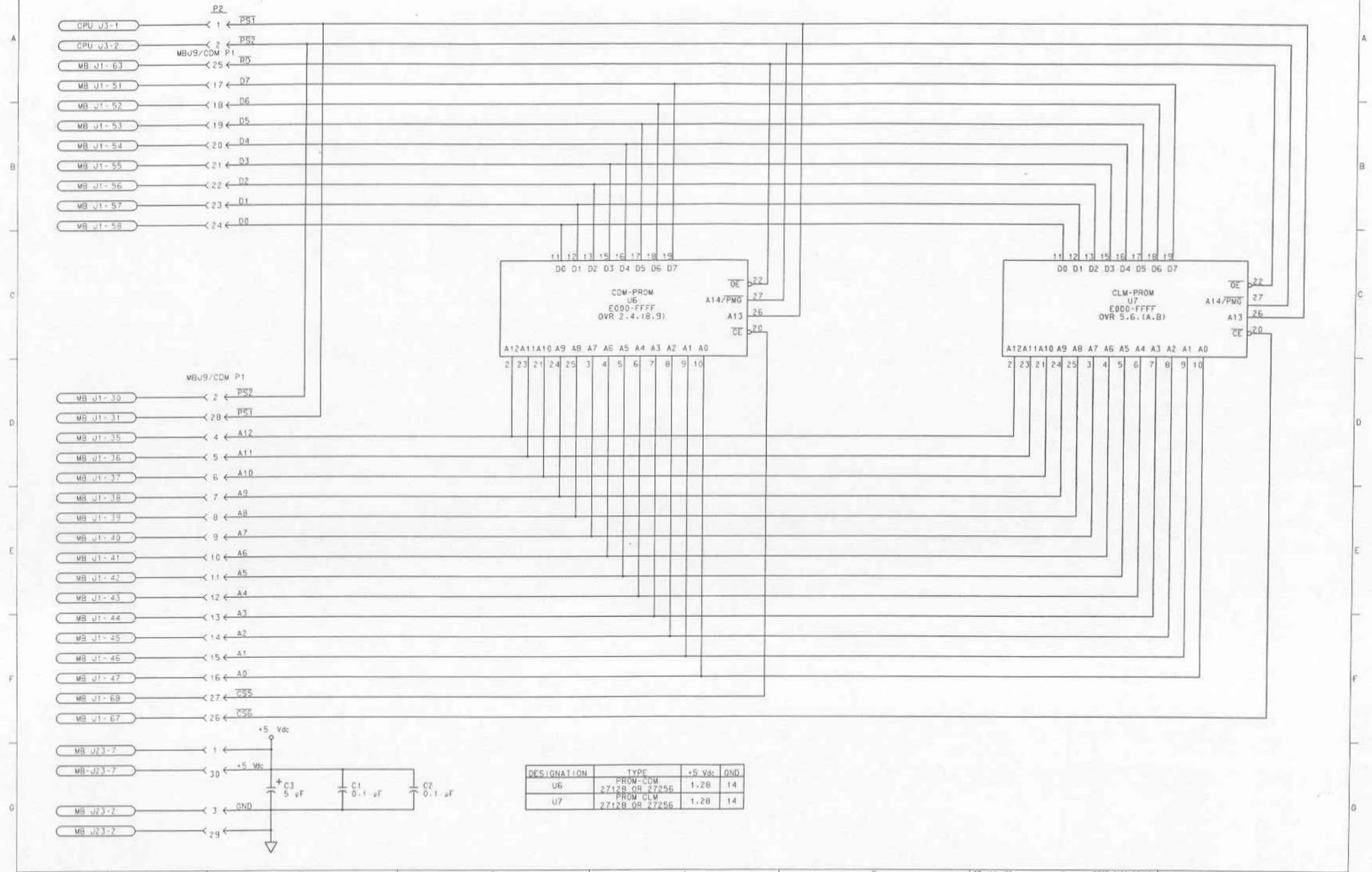


Figure 19 CDM/CLM BOARD - V10.7 and V11.0 Software



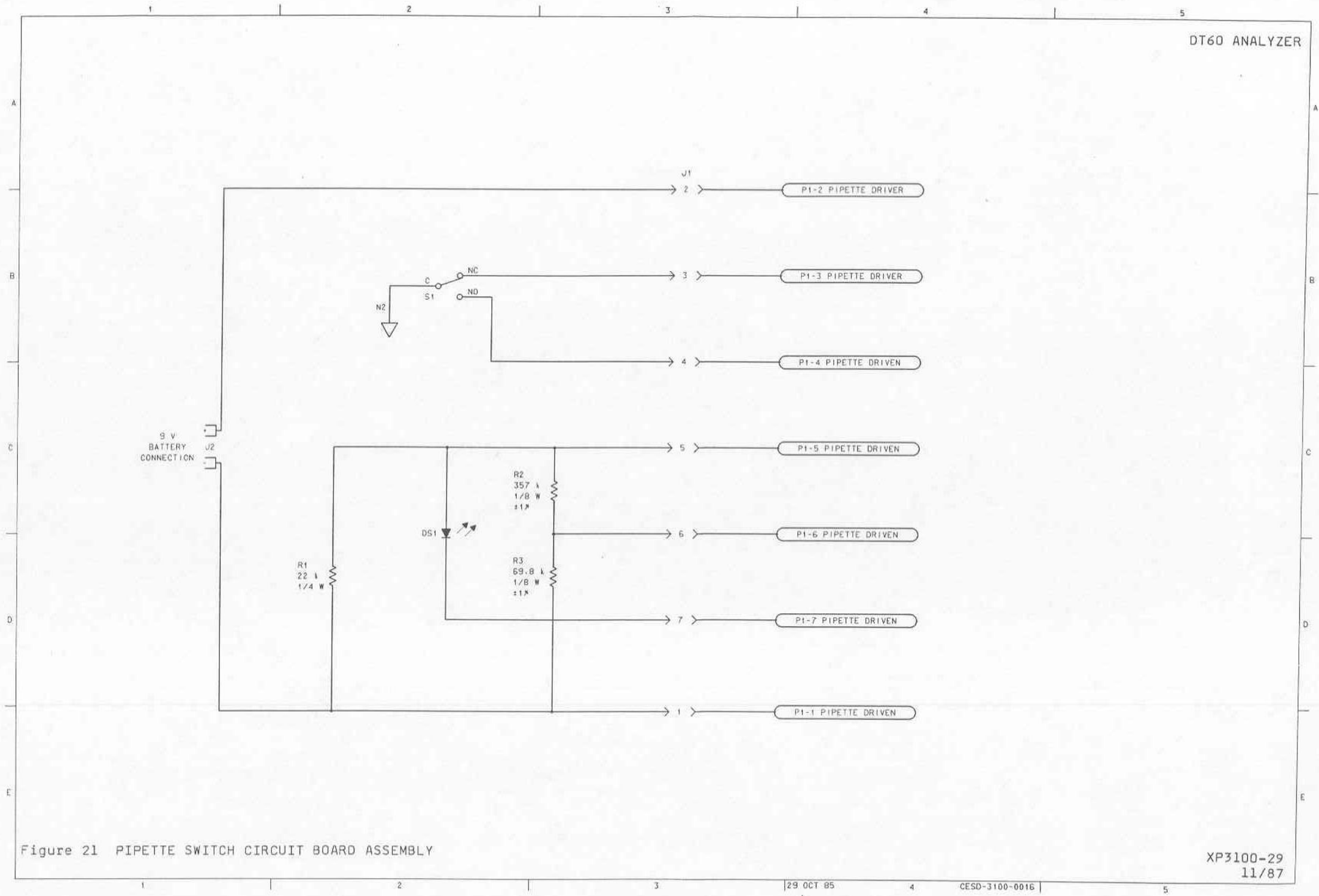
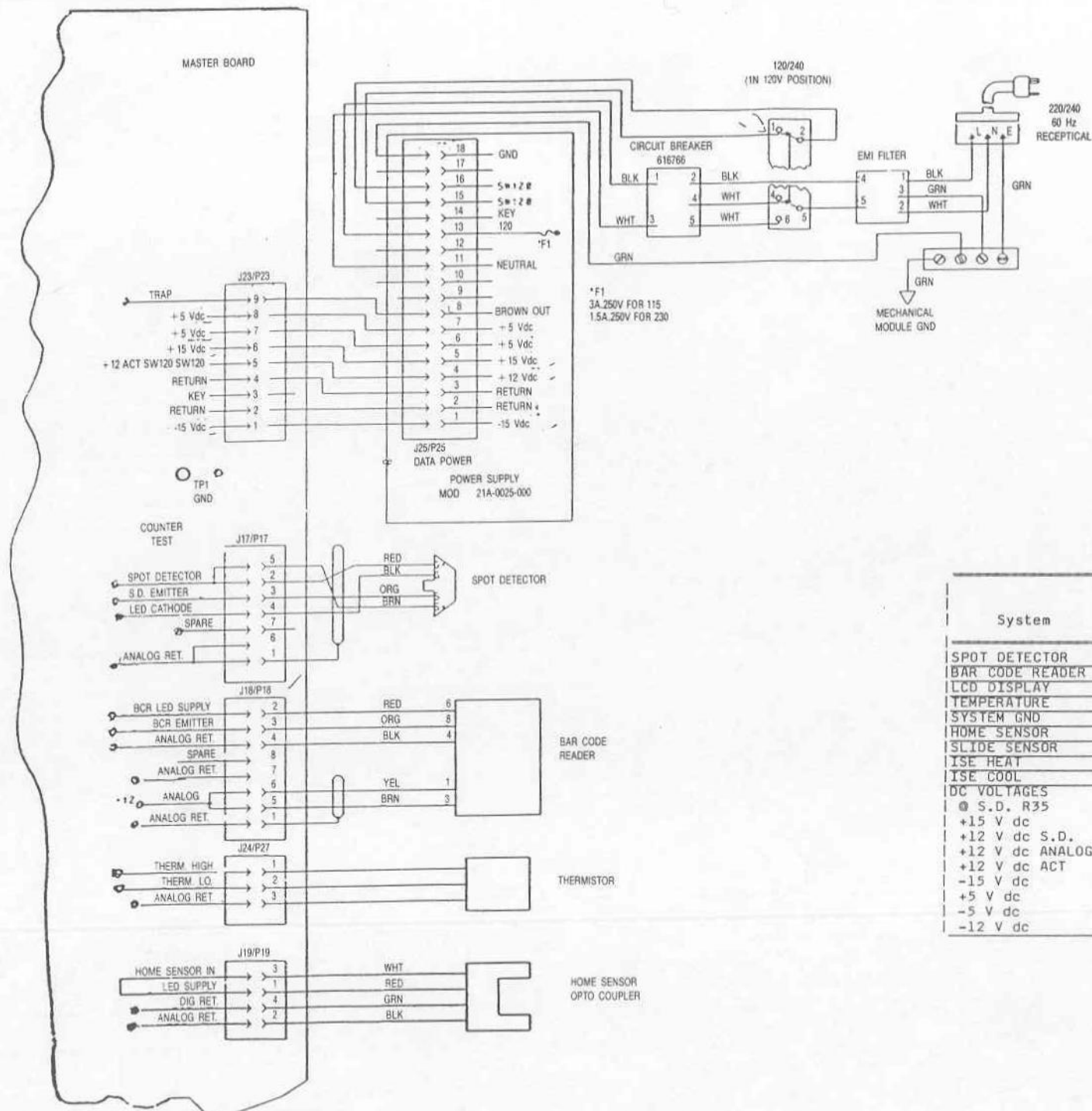
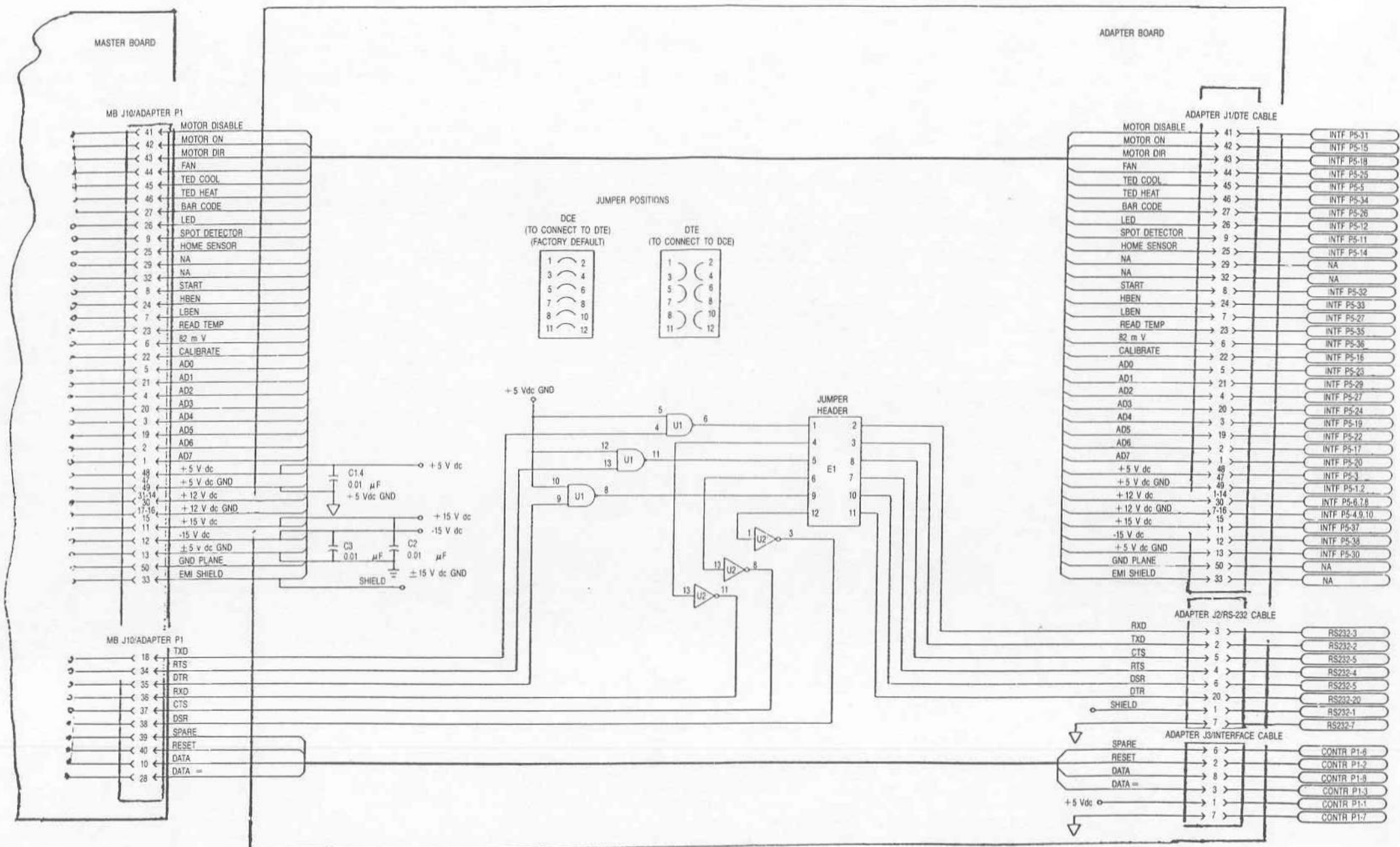


Figure 21 PIPETTE SWITCH CIRCUIT BOARD ASSEMBLY



System	Test Points	Test Pads	LED (Red)	POT	Nominal dc Voltage at Test Point
SPOT DETECTOR	TP 3	---	DS5	R35	+5.53 - +6.03
BAR CODE READER	TP14	---	DS1	R108	-9.0 - -11.0
LCD DISPLAY	TP13	---	---	R76	-1.2 - -2.70
TEMPERATURE	TP12	---	DS6	R73	36.7 - 37.3 C
SYSTEM GND	TP10	---	---	---	---
HOME SENSOR	---	---	DS7	---	---
SLIDE SENSOR	---	---	DS4	---	---
ISE HEAT	---	---	DS2	---	---
ISE COOL	---	---	DS3	---	---
DC VOLTAGES					
0 S.D. R35	---	TP1	---	R35	---
+15 V dc	---	TP2	---	---	+14.5 - +15.5
+12 V dc S.D.	---	TP4	---	---	+11.4 - +12.6
+12 V dc ANALOG	---	TP5	---	---	+11.4 - +12.6
+12 V dc ACT	---	TP11	---	---	+11.0 - +13.0
-15 V dc	---	TP8	---	---	-14.5 - -15.5
+5 V dc	---	TP6	---	---	+4.85 - +5.15
-5 V dc	---	TP9	---	---	-4.75 - -5.25
-12 V dc	---	TP7	---	---	-11.4 - -12.6

Figure 22: MASTER BOARD INTERCONNECT - Power Distribution, SPOT DETECTOR, BAR CODE READER, THERMISTOR, and HOME SENSOR



DESIGNATION	TYPE	+5 Vdc	+15 Vdc	-15 Vdc	+15 Vdc GND	+5 Vdc GND
U1	MC1488	5, 10, 12	14	1	2, 7	
U2	MC1489	14				7

Figure 23: MASTER BOARD INTERCONNECT — ADAPTER BOARD

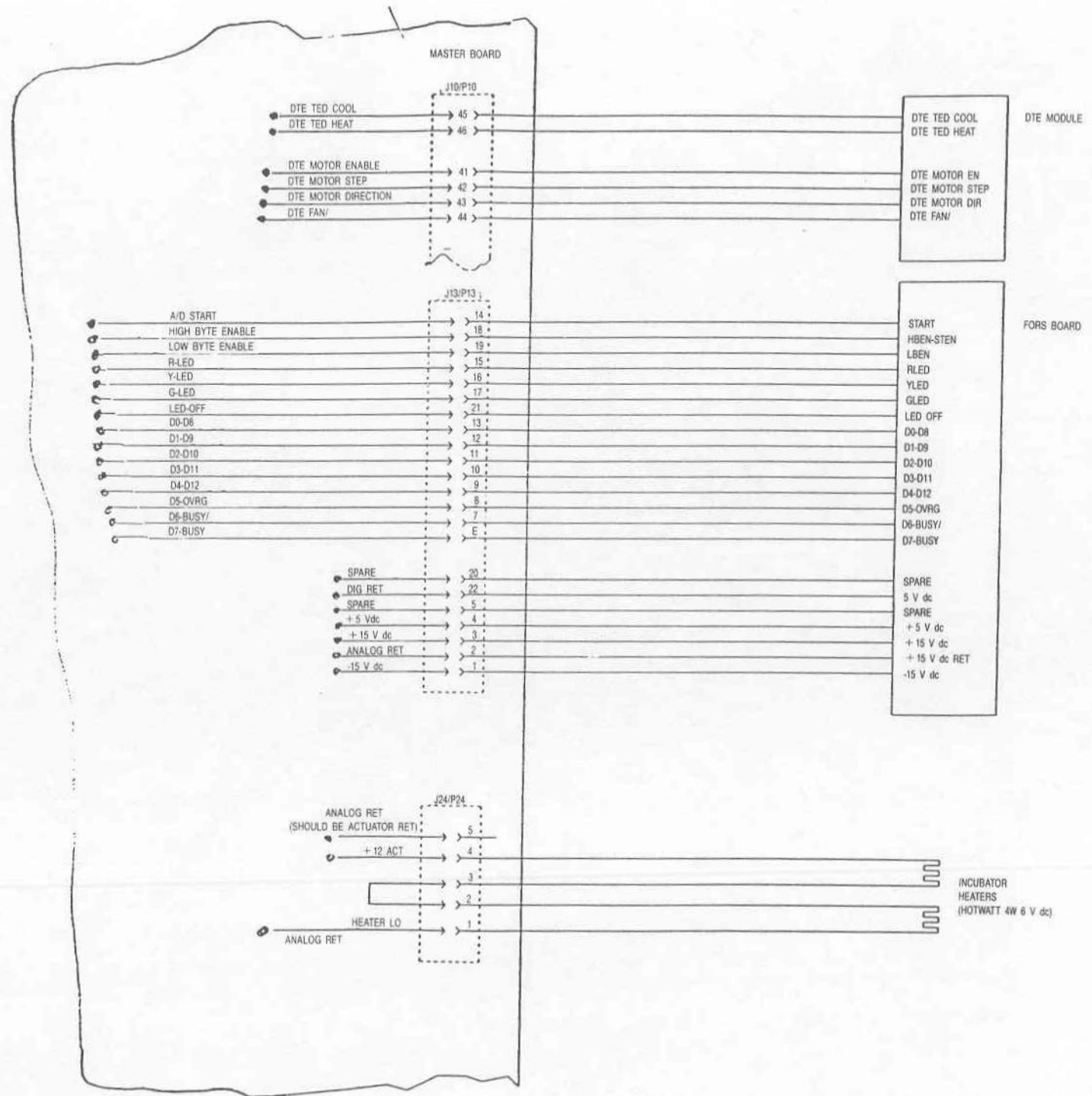


Figure 24: MASTER BOARD INTERCONNECT - FORS ASSEMBLY, INCUBATOR HEATER, HEAT PUMP for DTE MODULE

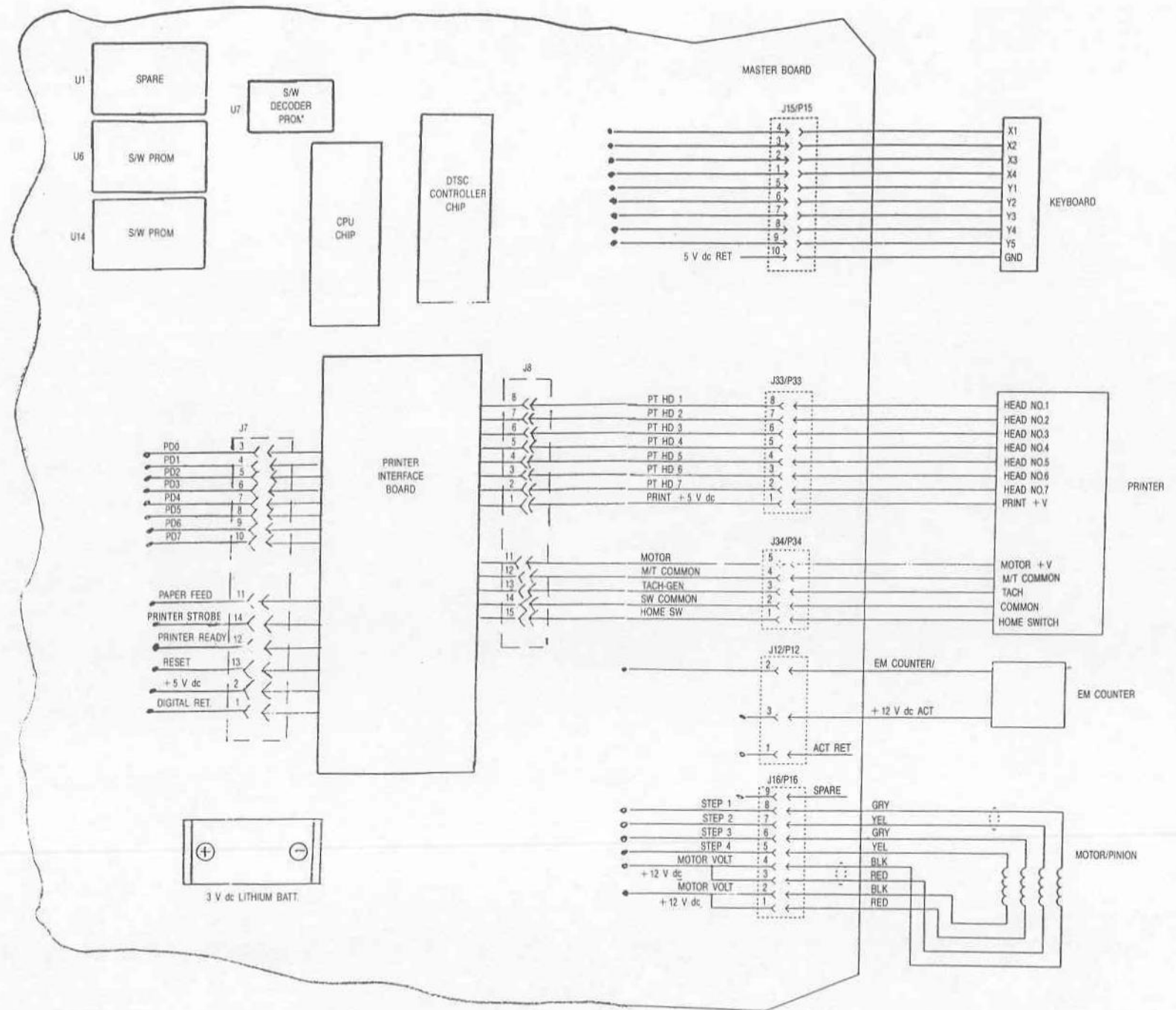


Figure 25: MASTER BOARD INTERCONNECT — KEYBOARD, PRINTER, ACTUATION COUNTER, MOTOR AND PINION ASSEMBLY, PRINTER BOARD

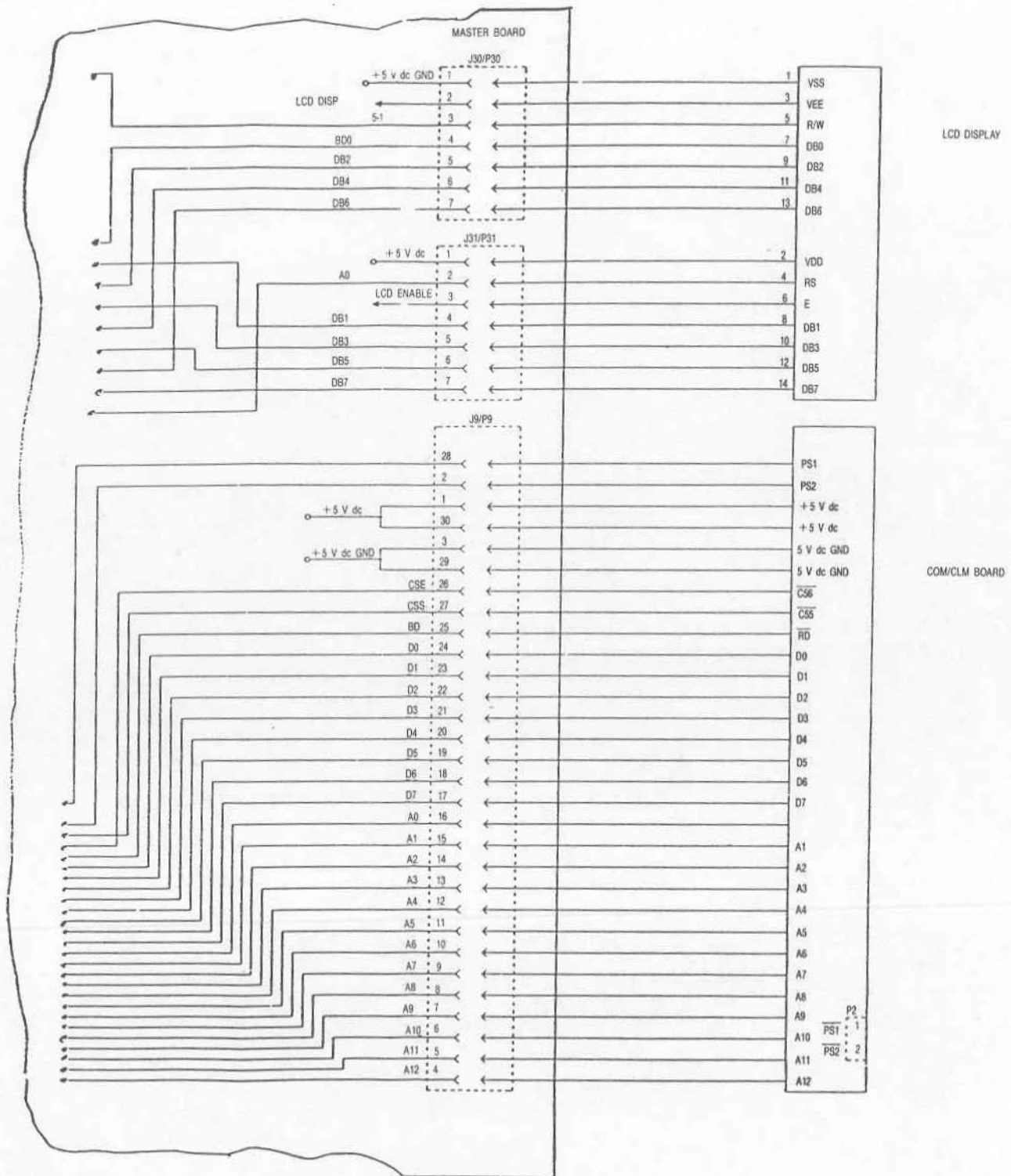


Figure 26: MASTER BOARD INTERCONNECT — LCD DISPLAY and COM/CLM BOARD

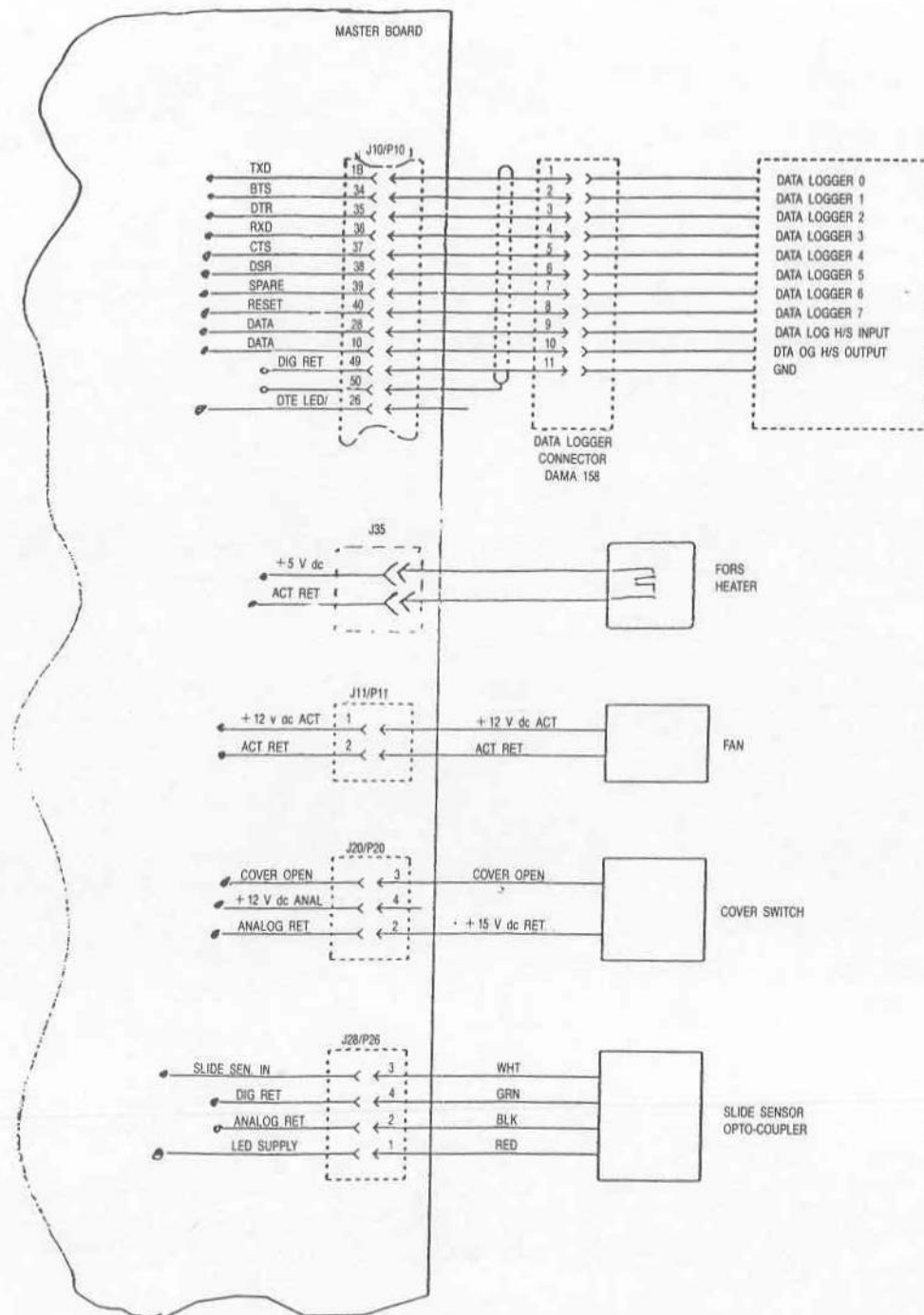


Figure 27: MASTER BOARD INTERCONNECT - FAN, COVER SWITCH, SLIDE SENSOR, DATA LOGGER, and FORS HEATER

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Kodak Ektachem DTE MODULE Diagrams Section 7

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.....
· CAUTION ·
.....

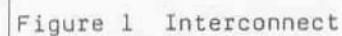


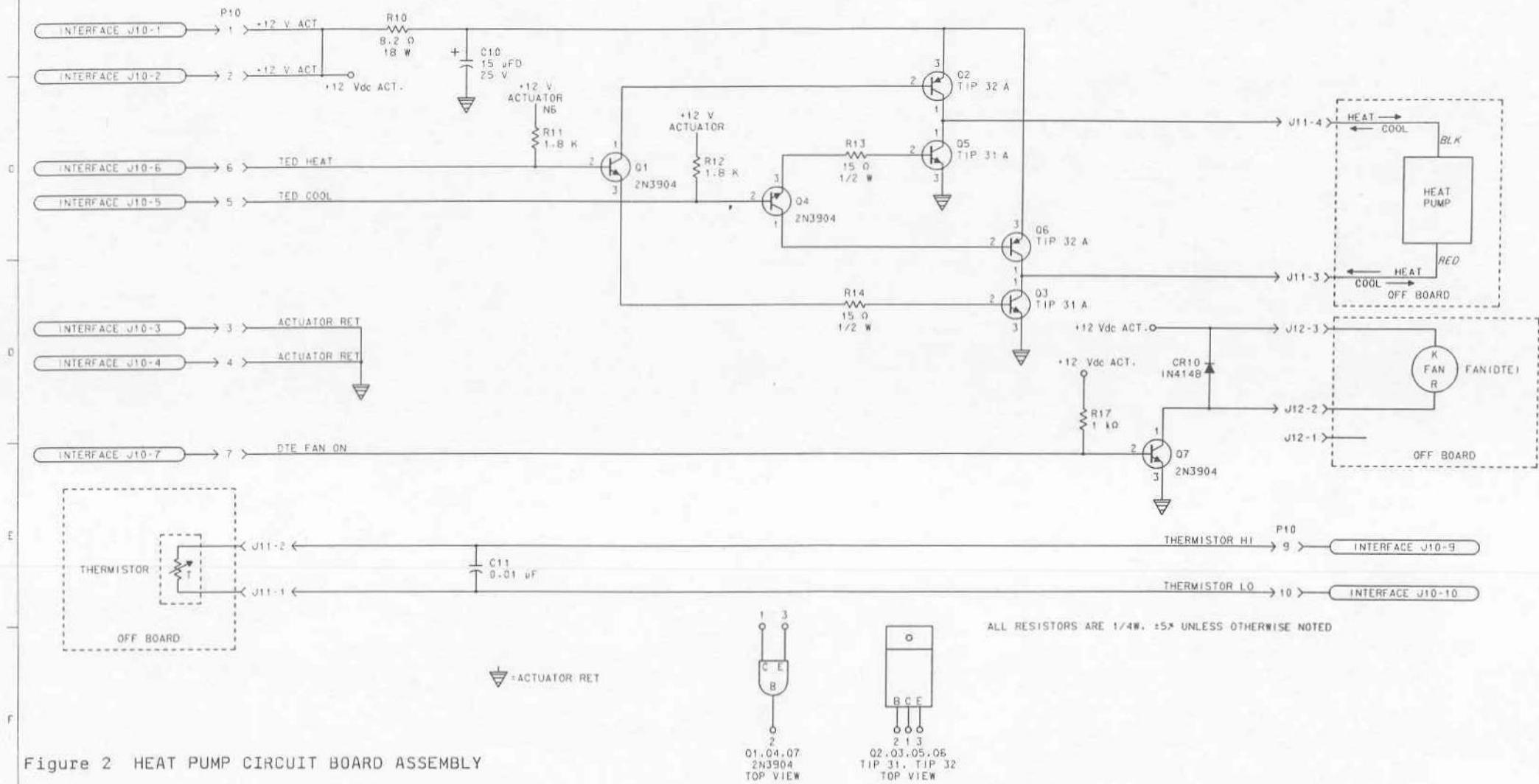
This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

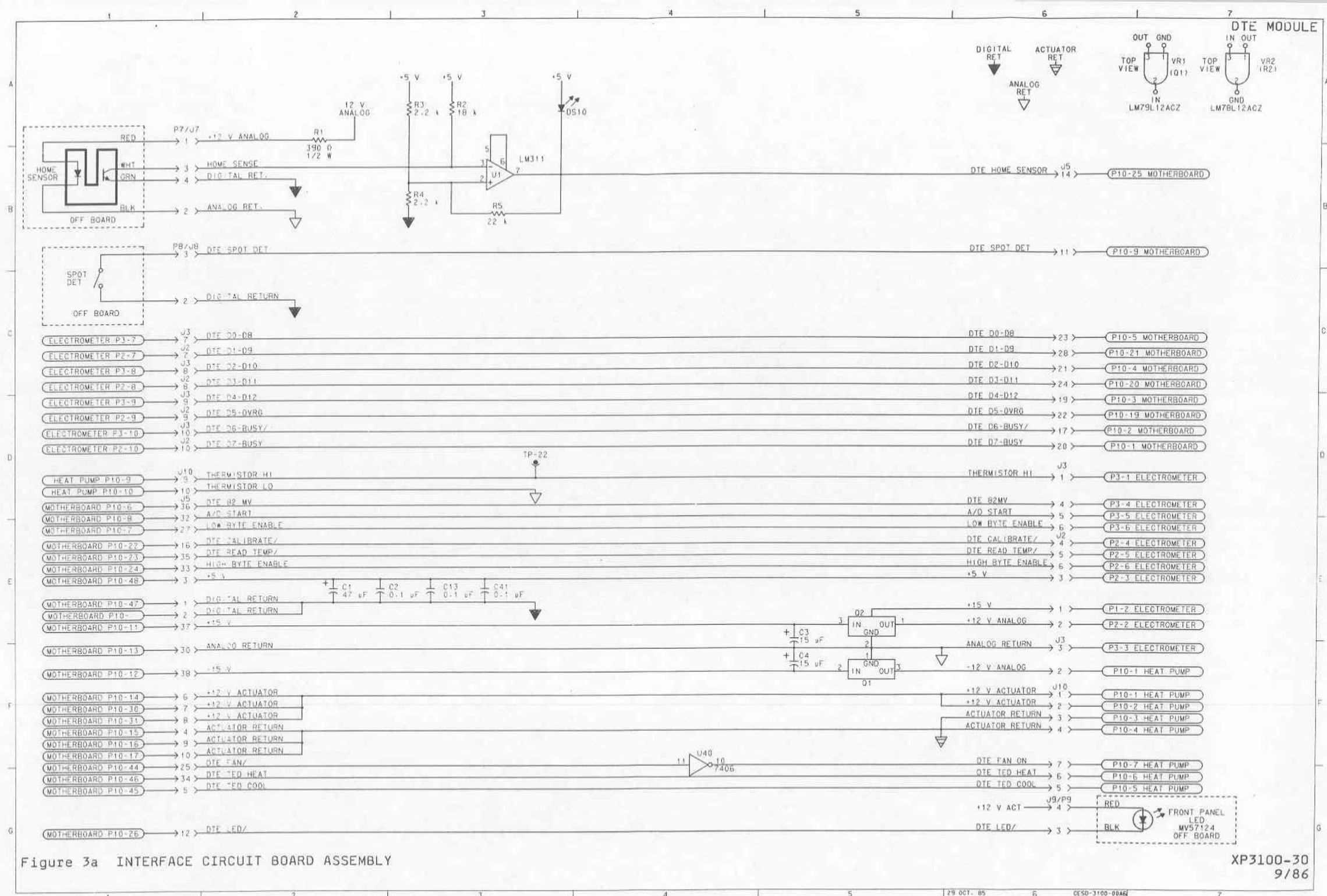
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DTE MODULE Diagrams

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HEAT PUMP CIRCUIT BOARD ASSEMBLY	2
INTERFACE CIRCUIT BOARD ASSEMBLY	3a, 3b
ELECTROMETER CIRCUIT BOARD ASSEMBLY	4







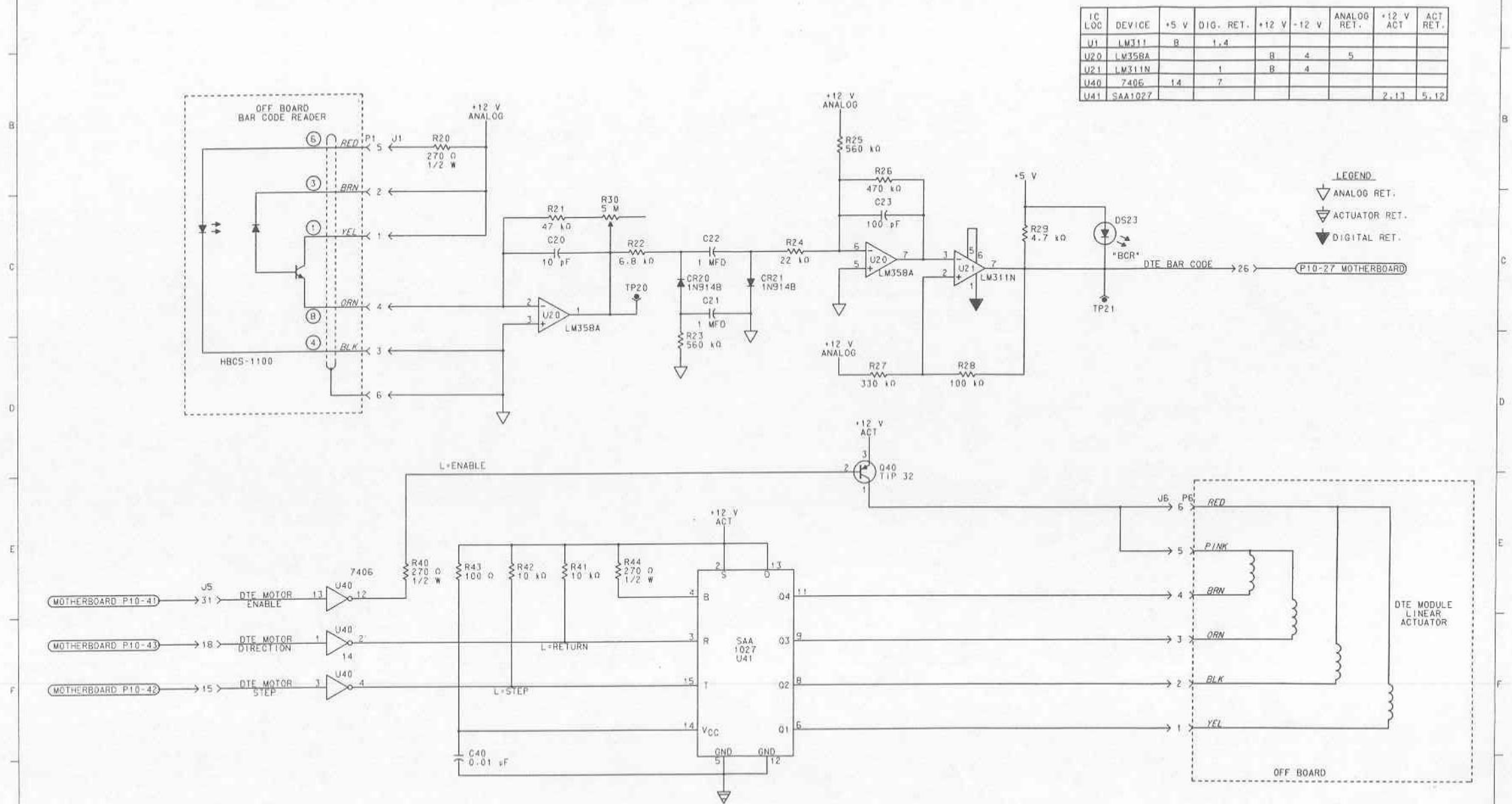


Figure 3b INTERFACE CIRCUIT BOARD ASSEMBLY

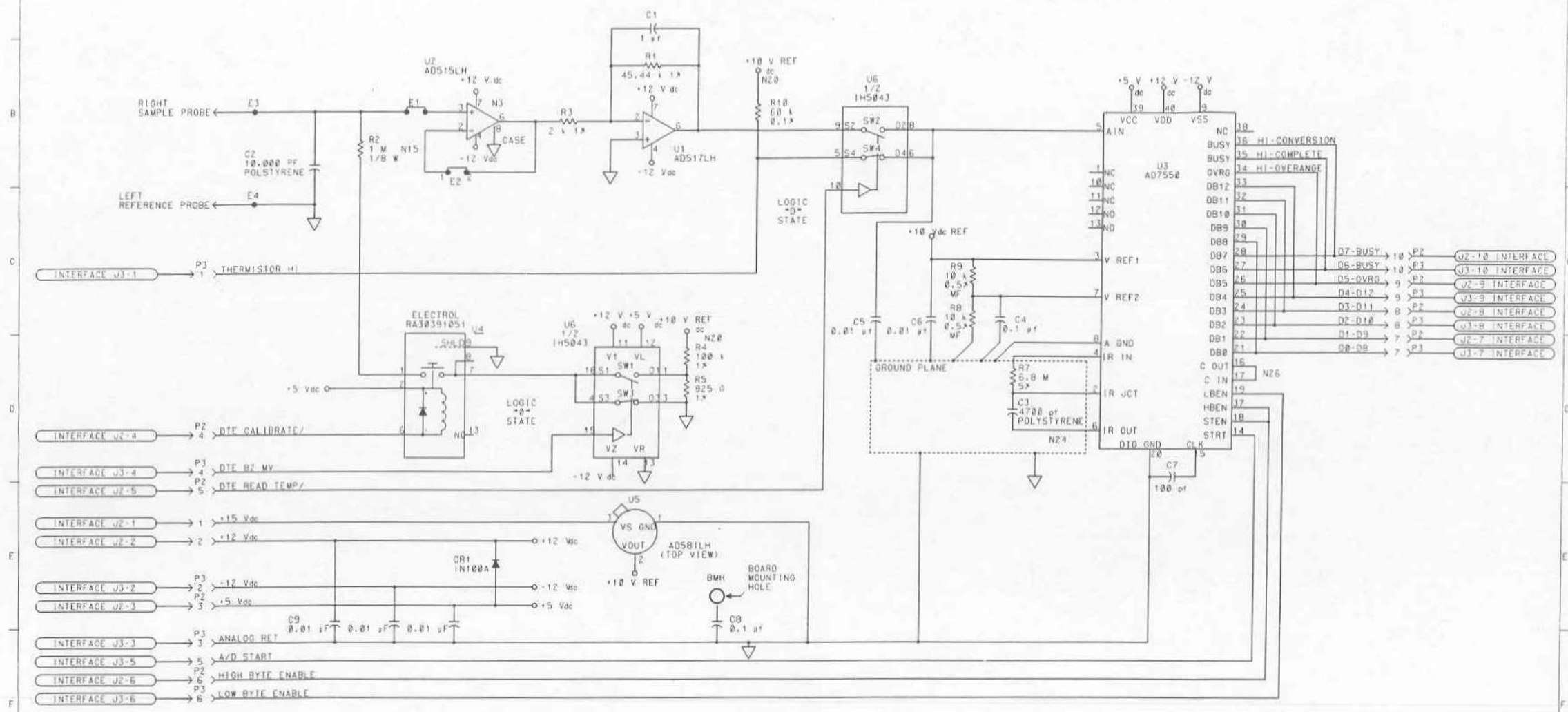


Figure 4 ELECTROMETER CIRCUIT BOARD ASSEMBLY

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Kodak Ektachem DT60 ANALYZER

Adjustments and Special Procedures

Section 8

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Kodak Ektachem DT60 ANALYZER

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ADJUSTMENTS

BAR CODE READER - Multi-Board Configuration

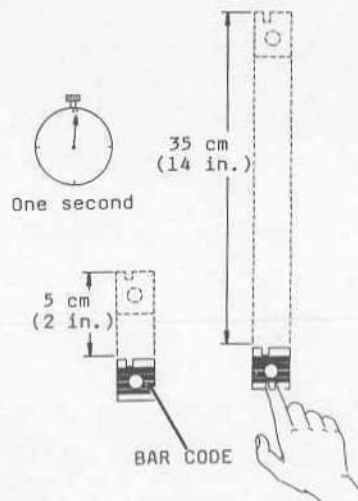
Purpose:

As an inserted slide moves to the Spotting Station, the BAR CODE READER emits a light beam from an LED that scans the BAR CODE on the slide. Some of this light is reflected from the slide up to the BAR CODE READER. The BAR CODE READER then transmits a series of voltage signals corresponding to the amount of light reflected from the black and white lines in the BAR CODE. The software can decode the signals to detect the chemistry and the generation number of the inserted slide.

The position of the BAR CODE READER can be adjusted to provide a focus that emits and receives the optimum light reflection from the slide. In some older DT60 ANALYZERS, the TAB on the BAR CODE READER was placed toward the left side of the ANALYZER. In newer ANALYZERS, the TAB is toward the front or the back of the ANALYZER, parallel to the slide path. The newer position of the TAB can improve the ability of the BAR CODE READER to decode the BAR CODE, but if the BAR CODE READER operates within specifications, the position of the TAB should not be changed. The voltage specification is different for each of the 2 directions.

After the correct focus is obtained, POTENTIOMETER R47 on the DRIVER BOARD sets the gain for the voltage signal from the BAR CODE READER. The objective of this adjustment is to set the POTENTIOMETER to provide a signal at an optimum voltage that the BAR CODE READER can read within the operating parameters. If the BAR CODE READER is not adjusted correctly, the system will not be able to detect the difference between the signals for the black lines and the white lines.

Because slides are inserted manually, the speed of motion under the BAR CODE READER has variations. The BAR CODE READER must be able to decode the BAR CODE for both slow and fast insertion speeds. A slow speed is 5 cm (2 in.) per second. A fast speed is 35 cm (14 in.) per second.



"Slide Identification System" in Section 2, Normal Operation of the DT60 ANALYZER, has more information about measuring insertion speeds.

The BAR CODE SLIDE TL-3482 has a surface with uniform white reflectance, to allow you to set the voltage with precision.

Specifications:

Insert the BAR CODE SLIDE TL-3482 with the white surface up. If the TAB on the BAR CODE READER is toward the left of the ANALYZER, the voltage should be - 5.25 to -5.75 V dc. If the TAB on the BAR CODE READER is toward the front or back of the ANALYZER, the voltage should be - 4.25 to -4.75 V dc.

When to Do:

- After installing a new BAR CODE READER.
- When diagnosing error messages for "SLIDE NOT IDENTIFIED" or "DISCARD CM SLIDE".

Special Requirements:

This procedure is only for ANALYZERS with the Multi-Board Configuration. Another adjustment procedure is used for ANALYZERS with the Single-Board Configuration. The height adjustment for the TIP SEAT must be checked after the PIPETTE LOCATOR COVER is removed and installed.

Special Tools: MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Test Points:

MULTIMETER TL-3424	
+	-
TP 5 on DRIVER BOARD	TP 1 on MOTHER BOARD

POTENTIOMETER: R47 on the DRIVER BOARD

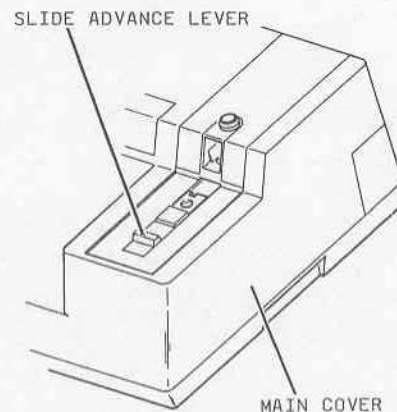
Description: To obtain the correct adjustment, you must:

- Insert slides at different speeds to see if an adjustment is necessary.
- Adjust the POTENTIOMETER to obtain the voltage specification.
- If the voltage specification cannot be obtained by adjusting the POTENTIOMETER, adjust the focus by changing the position of the TAB. Then adjust the voltage again to be correct for the new focus.

To Check:

In steps 1 and 2 you will check to determine if an adjustment is necessary. You will test the operation of the BAR CODE READER by inserting slides from different chemistries, to see if they are identified correctly. To check that the BAR CODE READER operates correctly at all insertion speeds, insert some of the slides slowly, and some of the slides fast.

- [1] Use the SLIDE ADVANCE LEVER to insert slides for different available chemistries under the BAR CODE READER. Move the PUSHER BLADE at slow and fast speeds, from 5 cm (2 in.) per second, to 35 cm (14 in.) per second.



- [2] Do the messages on the LC DISPLAY indicate that all slides are correctly identified?



The adjustment is correct. This procedure is completed.

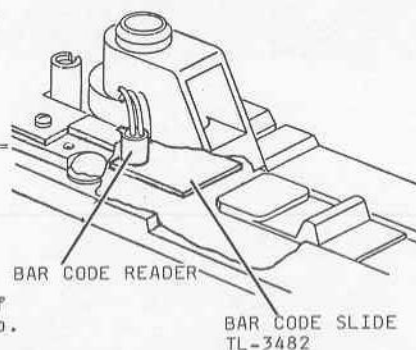


Advance to step 3.

In steps 3 to 7, you will determine if the voltage can be adjusted to specification without adjusting the focus. If the voltage adjustment does not provide correct operation, you will advance to the focus adjustment.

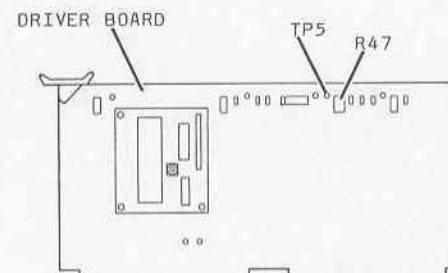
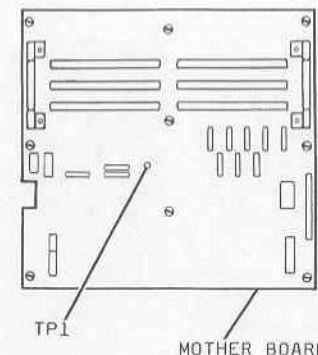
- [3] Remove the MAIN COVER.

- [4] Insert the BAR CODE SLIDE TL-3482 under the BAR CODE READER. The white surface of the BAR CODE SLIDE must be up.

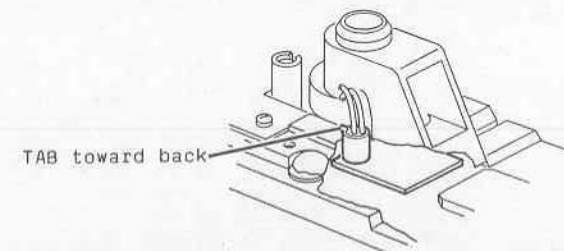


- [5] Connect:

MULTIMETER TL-3424	
+	-
TP5 on DRIVER BOARD	TP1 on MOTHER BOARD



- [6] If the TAB on the BAR CODE READER is toward the left, rotate POTENTIOMETER R47 on the DRIVER BOARD to obtain -5.25 to -5.75 V dc. If the TAB is toward the front or the back, rotate R47 to obtain -4.25 to -4.75 V dc.



- [7] Insert some slides as you did in step 1.
Are the slides correctly identified?



The procedure is completed.



Advance to step 8.
Do not disconnect
MULTIMETER TL-3424.

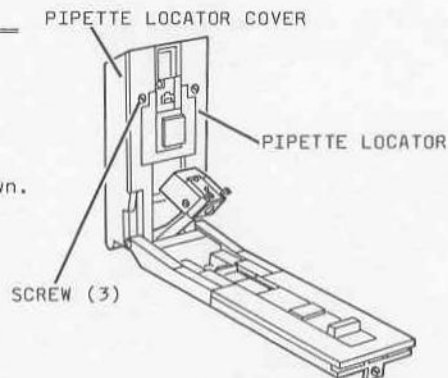
In steps 8 to 18, you will adjust
the focus to obtain maximum
voltage.

- [8] Remove:

- 3 SCREWS
- PIPETTE LOCATOR COVER

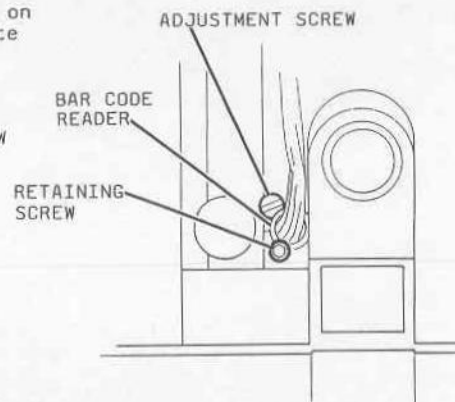
- [9] Move the PIPETTE LOCATOR down.

- [10] With the white side up,
insert the BAR CODE SLIDE
TL-3482 under the BAR CODE
READER.



- [11] Loosen the RETAINING SCREW on
the PIPETTE LOCATOR. Rotate
counterclockwise.

- [12] Rotate the ADJUSTMENT SCREW
fully clockwise.



- [13] If the TAB is toward the
left, move it to the back.

- [14] Tighten the RETAINING SCREW clockwise, only until it touches
the BAR CODE READER.
- [15] Pull and hold the BAR CODE READER up against the RETAINING
SCREW, and slowly rotate the RETAINING SCREW counterclockwise
until the maximum voltage is reached.
- [16] Rotate the ADJUSTMENT SCREW counterclockwise until it touches
the BAR CODE READER.
- [17] Tighten the RETAINING SCREW over the BAR CODE READER.
- [18] Check that the voltage reading does not change more than
0.3 V dc when you tighten the RETAINING SCREW.

.....
• CAUTION •
.....

Do not tighten the 3 SCREWS with excessive force. Excessive
tightening could change the focus of the BAR CODE READER or
cause a bind in the UPPER ARM.

- [19] Install:

- 3 SCREWS
- PIPETTE LOCATOR COVER
- MAIN COVER

In step 20, you will adjust the voltage to be correct for the new
focus.

- [20] Rotate POTENTIOMETER R47 to obtain a -4.25 to -4.75 V dc.

- [21] Remove the BAR CODE SLIDE TL-3482.

- [22] Disconnect MULTIMETER TL-3424.

- [23] Because the PIPETTE LOCATOR COVER was removed, check that the
adjustment for the height of the TIP SEAT is correct.

Checkout for Correct Adjustment:

- [24] With the DT60 ANALYZER in the "service" mode, insert slides for
different chemistries, at fast and slow speeds. Check that the
slides are correctly identified. If the slides are identified
at only one speed, adjust the voltage up or down until the BAR
CODE READER can identify slides at fast speed and slow speed.

- [25] Install the MAIN COVER.

BAR CODE READER — Single-Board Configuration

Purpose:

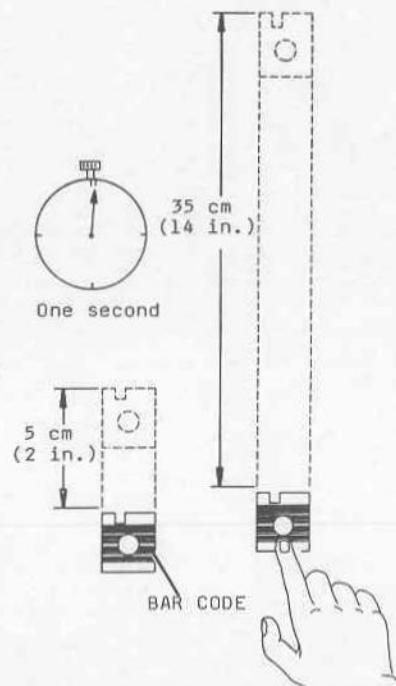
As an inserted slide moves to the Spotting Station, the BAR CODE READER emits a light beam from an LED that scans the BAR CODE on the slide. Some of this light is reflected from the slide up to the BAR CODE READER. The BAR CODE READER then transmits a series of voltage signals corresponding to the amount of light reflected from the black and white lines in the BAR CODE. The software can decode the signals to detect the chemistry and generation number of the inserted slide.

The position of the BAR CODE READER can be adjusted to provide a focus that emits and receives the optimum light reflection from the slide.

After the correct focus is obtained, POTENTIOMETER R108 on the MASTER BOARD sets the gain for the voltage signal from the BAR CODE READER. The objective of this adjustment is to set the POTENTIOMETER to provide a signal at an optimum voltage that the BAR CODE READER can read within the operating parameters. If the BAR CODE READER is not adjusted correctly, the system will not be able to detect the difference between the signals for the black lines and the signals for the white lines.

Because slides are inserted manually, the speed of motion under the BAR CODE READER has variations. The BAR CODE READER must be able to decode the BAR CODE for both slow and fast insertion speeds. A slow speed is 5 cm (2 in.) per second. A fast speed is 35 cm (14 in.) per second. "Slide Identification System" in Section 2, Normal Operation of the DT60 ANALYZER, has more information about measuring the insertion speeds.

The BAR CODE SLIDE TL-3482 has 2 surfaces with uniform white



reflectance and uniform black reflectance, to allow you to set the voltage with precision. In the Multi-Board Configuration, only adjustment for white reflectance is necessary. In the Single-Board Configuration, both the white and black surfaces of the BAR CODE SLIDES are used for the adjustment. The white reflectance reading in the MASTER BOARD might provide a maximum value that is actually above the correct operating parameters. You must check that the white reading and the black reading have a minimum difference of 4.5 V. The voltage specifications for the Single-Board Configuration and the Multi-Board Configuration are not the same.

All BAR CODE READERS in the Single-Board Configuration are installed with the TAB toward the back. The voltage specification is given for this position only.

Specifications:

Both surfaces of the BAR CODE SLIDE TL-3482 should be used. The voltage reading for the white reflectance surface should be approximately -10 V dc. The difference between the white reflectance and the black reflectance must be 4.5 V or more. The BAR CODE READER must be able to identify slides correctly at fast and slow insertion speeds.

The circuit for the BAR CODE READER in the Single-Board configuration is more sensitive than the circuit in the Multi-Board configuration. If the adjustment is not made correctly, the BAR CODE READER might detect the trailing edge of a slide as it is moved from the Spotting Station to the INCUBATOR. The computer interprets this signal from the BAR CODE READER as a new slide, but because no BAR CODE is detected, a "REMOVE CM SLIDE" message is displayed. The maximum reading ability of the circuit for white reflectance occurs when the gain for the circuit is adjusted at approximately -10.5 to -10.7 V dc. If the gain is increased to more than -10.5 to -10.7, the difference between white and dark readings decreases. If the "REMOVE CM SLIDE" message occurs when the voltage for white reference is -10.0 V dc, the voltage can be decreased to a minimum of -9.85. The voltage for the black reference must also be decreased to allow a difference of 4.5 V from the white reference voltage.

When to Do:

- After installing a new BAR CODE READER.
- When diagnosing error messages for "SLIDE NOT IDENTIFIED" or "REMOVE CM SLIDE".

Special Requirements:

This procedure is only for ANALYZERS with the Single-Board Configuration. Another adjustment procedure is used for ANALYZERS with the Multi-Board Configuration.

Special Tools: MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Test Points:

MULTIMETER TL-3424	
+	-
TP14 on MASTER BOARD	TP10 on MASTER BOARD

POTENTIOMETER: R108 on the MASTER BOARD

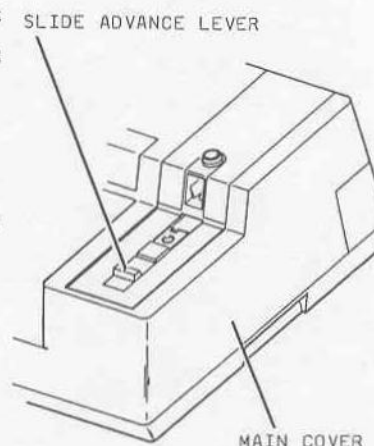
Description: To obtain the correct adjustment, you must:

- Insert slides at different speeds to see if an adjustment is necessary.
- Adjust the POTENTIOMETER to try and obtain the specification.
- If necessary, adjust the focus.
- Adjust the voltage to be correct for the new focus.

To Check:

In steps 1 and 2 you will check to determine if an adjustment is necessary. You will test the operation of the BAR CODE READER by inserting slides from different chemistries, to see if they are identified correctly. Different types of slides are used to check for variations in the reflectances of different slide materials. To check that the BAR CODE READER operates correctly at all insertion speeds, insert some slides slowly, and some slides fast.

- [1] Use the SLIDE ADVANCE LEVER to insert used slides for different available chemistries under the BAR CODE READER. Move the LEVER at slow and fast speeds, from 5 cm (2 inches) per second, to 35 cm (14 inches) per second.



- [2] Do the messages on the LC DISPLAY indicate that all the slides are correctly identified?



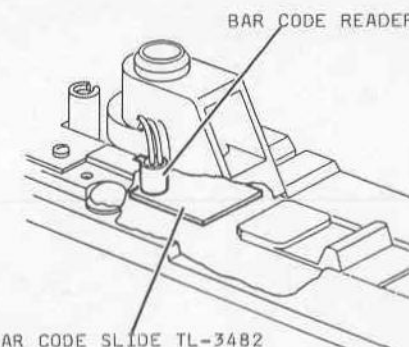
The adjustment is correct.
This procedure is completed.



Advance to step 3.

- [3] Remove the MAIN COVER.

In steps 4 to 11, you will determine if the voltage can be adjusted to specification without adjusting the focus. If the voltage adjustment does not provide correct operation, you will advance to the focus adjustment.



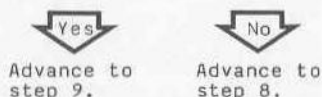
- [4] Insert the BAR CODE SLIDE TL-3482 under the BAR CODE READER. The white surface of BAR CODE SLIDE must be up.

[5] Connect:

MULTIMETER TL-3424	
+	-
TP 14 on MASTER BOARD	TP 10 on MASTER BOARD

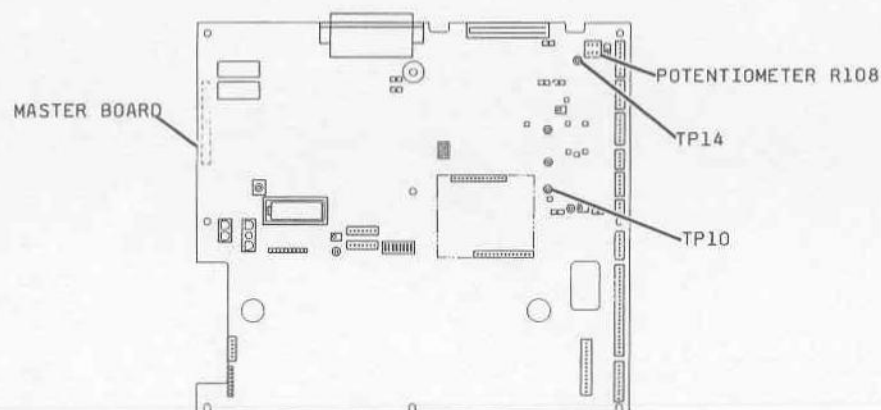
[6] Rotate POTENTIOMETER R108 fully counterclockwise.

[7] Is the voltage -10 V dc or more?



[8] Rotate POTENTIOMETER R108 clockwise to obtain a voltage reading of approximately -10 V dc.

[9] Record the voltage for the white reflectance.



[10] Remove the BAR CODE SLIDE TL-3482 and insert it again with the black side up.

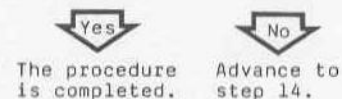
[11] Check the voltage reading for the black reflectance and compare it with the voltage recorded in step 9. Is the difference in voltage for the white reflectance and the black reflectance 4.5 V or more?



[12] Rotate POTENTIOMETER R108 fully counterclockwise measure the voltage again. If the voltage continues to be out of specification, a replacement for one of the following parts might be necessary:

- BAR CODE TOOL SLIDE TL-3482
- BAR CODE READER
- MASTER BOARD

[13] Insert slides for different chemistries, at fast and slow speeds. Are the slides correctly identified?

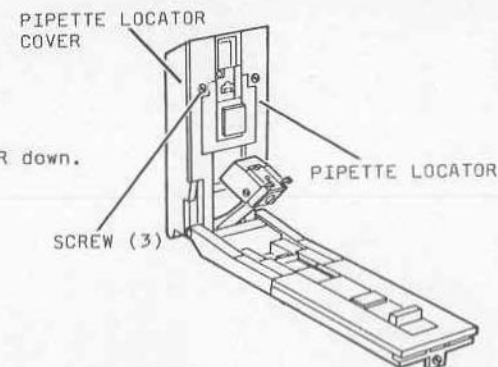


In steps 14 to 24, you will adjust the focus to obtain maximum voltage. You will start measuring voltage with the BAR CODE READER at the minimum distance from the slide. You will slowly increase the distance until a maximum voltage is reached.

[14] Remove:

- 3 SCREWS
- PIPETTE LOCATOR COVER

[15] Move the PIPETTE LOCATOR down.

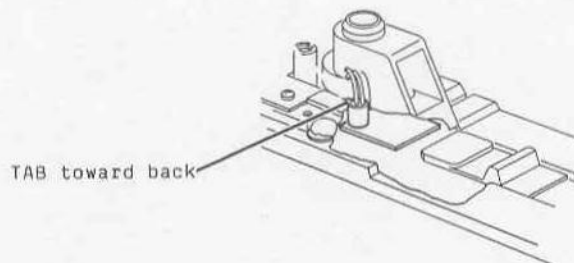
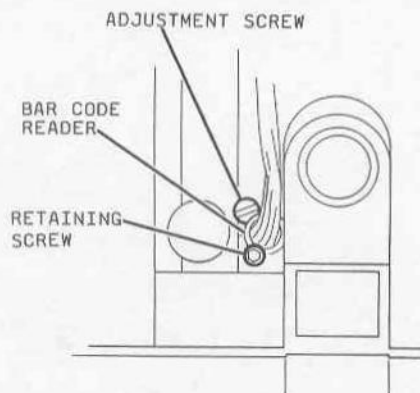


[16] Insert the BAR CODE SLIDE TL-3482 under the BAR CODE READER with the black side up.

[17] Loosen the RETAINING SCREW on the PIPETTE LOCATOR. Rotate counterclockwise.

[18] Rotate the ADJUSTMENT SCREW fully clockwise.

[19] If the TAB is toward the left, move it to the back.



[20] Tighten the RETAINING SCREW clockwise, only until it touches the BAR CODE READER.

[21] Pull and hold the BAR CODE READER up against the RETAINING SCREW, and slowly rotate the RETAINING SCREW counterclockwise until the maximum voltage is reached.

[22] Rotate the ADJUSTMENT SCREW counterclockwise until it touches the BAR CODE READER.

[23] Tighten the RETAINING SCREW over the BAR CODE READER.

[24] Check that the voltage reading does not change more than 0.3 V dc when you tighten the RETAINING SCREW.

In steps 25 to 34, you will adjust the voltage to be correct for the new focus.

.....
• CAUTION •
.....

Do not tighten the 3 SCREWS with excessive force. Excessive tightening could change the focus of the BAR CODE READER or cause a bind in the UPPER ARM.

[25] Install:

- 3 SCREWS
- PIPETTE LOCATOR COVER

[26] Insert the BAR CODE SLIDE TL-3482 under the BAR CODE READER with the white surface up.

[27] Rotate POTENTIOMETER R108 fully counterclockwise.

[28] Is the voltage -10 V dc or more?



[29] Rotate POTENTIOMETER R108 clockwise to obtain a voltage reading of approximately -10 V dc.

[30] Record the voltage for the white reflectance.

[31] Remove the BAR CODE SLIDE TL-3482 and insert it again with the black side up.

- [32] Check the voltage reading for the black reflectance and compare it with the voltage recorded in step 30. Is the difference in voltage for the white reflectance and the black reflectance 4.5 V or more?



Advance to
step 34.



Advance to
step 33.

- [33] To obtain a white reference reading that is within the specification, do steps 26 to 30 again. Then do steps 31 and 32 again to check the difference between the white reflectance reading and the black reflectance reading.
- [35] Remove the BAR CODE SLIDE TL-3482.
- [36] Disconnect MULTIMETER TL-3424.
- [37] Install the MAIN COVER.
- [38] Because the PIPETTE LOCATOR COVER was removed, check that the height adjustment for the TIP SEAT is correct.

Checkout for Correct Adjustment:

- [39] Insert slides for different chemistries, at fast and slow speeds. Check that the slides are correctly identified.
- [40] If the slides are not identified correctly at all insertion speeds, a replacement for one of the following parts might be necessary:
- BAR CODE READER
 - BAR CODE SLIDE TL-3482
 - MASTER BOARD

You should also check that the DT60 ANALYZER is calibrated for the slides you are using.

FORS ASSEMBLY - Illumination

Purpose:

The FORS ASSEMBLY has 3 LEDS: green, yellow, and red. A closed loop circuit adjusts the illumination of each of the 3 LEDS. The POTENTIOMETERS for each of the LEDS must be adjusted to provide optimum illumination, but the adjustment must be low enough to allow the circuit to increase the voltage as the LEDS age. At the same time, an open loop circuit sets the gain for the readings. POTENTIOMETER R26 must be adjusted to provide a gain for the LED with the lowest measured voltage.

Additional information is included in the procedure, before each group of steps.

Description: The basic steps of the adjustment are:

- Clean the FORS HEAD and check it for damage.
- To check if an adjustment is necessary, use option 16 to check white and black reference readings.
- On older FORS ASSEMBLIES, set POTENTIOMETER R25 at null to enable accurate voltage measurements. Newer FORS ASSEMBLIES do not have this POTENTIOMETER.
- Determine which LED has the lowest measured voltage.
- Set the gain of the AMPLIFIER with POTENTIOMETER R26.
- Adjust the light output of the LEDS to an optimum value by adjusting the voltage.
- Check that these voltages provide correct A/D units.

Special Requirements:

Software version 9.0 or above must be installed.

Specifications:

For White Reference, check for A/D values of 3650 to 3850. If the correct values are not obtained, adjust the A/D values to 3690 to 3850. Each group of 5 values must be within 10 of each other.

For Black Reference, the A/D values must be -100 to +100. Each group of 5 values must be within 10 of each other.

When to Do:

Do this procedure when indicated in the diagnostics for "R" error codes.

Test Points: On the FORS ADJUSTMENT BOARD TL-3340:

TP6, for voltage through the LEDS
TP4, for control current
TP8, for gain
TP12, for ground

POTENTIOMETERS: On the FORS ASSEMBLY:

R25, to set null voltage.

NOTE

Not all FORS ASSEMBLIES have R25.

R26, to set the gain of the AMPLIFIER
R29, to set the red LED
R30, to set the yellow LED
R31, to set the green LED

Special Tools:

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424

To Check:

In steps 1 to 9, you will check to determine if an adjustment is necessary.

IMPORTANT

The MAIN COVER must be installed to avoid allowing excessive light into the reading area.

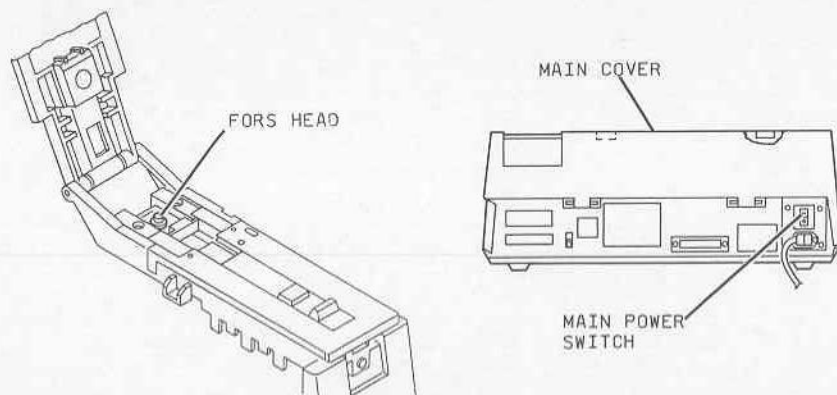
[1] To clean the FORS HEAD:

- Place a small quantity of distilled or "deionized" water on a tissue.
- Clean the FORS HEAD with circular motions.
- Use another tissue to dry the FORS HEAD.

[2] Move the MAIN POWER SWITCH up to the "1" position.

[3] Execute the following options and observe the FORS HEAD to check that the LEDS in the FORS ASSEMBLY operate and have a uniform display pattern. See the figures on page 8-20 for examples of display patterns that are "uniform" and "not uniform".

- Option 0, to reset the LOWER RACK
- Option 6, to check the green LED
- Option 7, to check the red LED
- Option 8, to check the yellow LED
- Option 0, to deenergize the LEDS



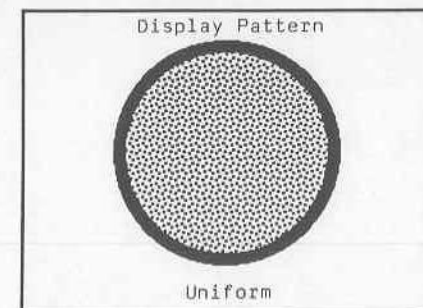
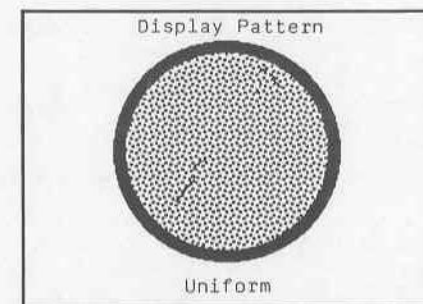
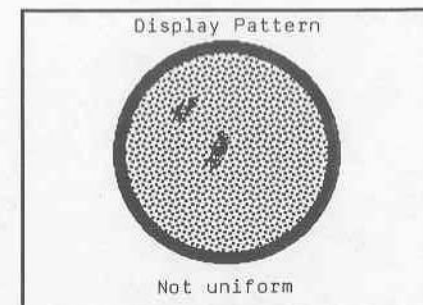
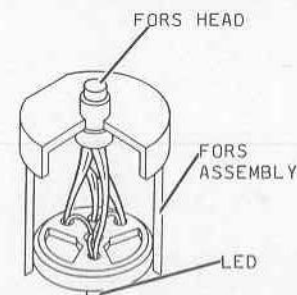
For correct operation, the display pattern on the FORS HEAD for each LED should be uniform. If the display pattern is not uniform, the reflectance values for the white reference and test slides might not be correct. Large dark areas visible in the display pattern indicate a possible malfunction of the FORS ASSEMBLY, but small dark spots might not change the reflectance results. The D_R Procedure is a test of the optics in the DT60 ANALYZER. If the D_R Procedure is within the specifications, installing a new FORS ASSEMBLY should not be necessary.

[4] If the display pattern is not uniform, and the D_R Procedure is not within the specifications, the FORS ASSEMBLY has a malfunction. Install a new FORS ASSEMBLY.

IMPORTANT

Step 5 allows the circuits to become stable.

[5] Wait 30 minutes until the DT60 ANALYZER reaches the correct operating temperature and the "ANALYZER READY" message is displayed.

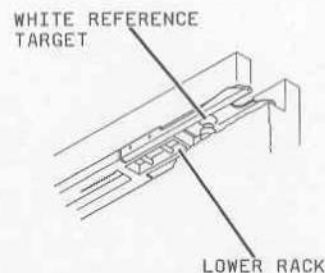


[6] Enter:

- Option 0 to move the RACKS to the home-position
- Option 2 to move the WHITE REFERENCE TARGET to the Read Station.

NOTE

The WHITE REFERENCE TARGET is on the bottom surface of the LOWER RACK.



[7] To check the A/D reading for the White Reference, do the following procedure until you have selected all "LED COLORS":

- Enter Option 16.
- See the table below and enter the number for one LED color.
- Enter "0" to select the number of steps.
- Enter "5" to select the number of readings.

To select "LED COLOR":	Enter Option:
Green	6
Red	7
Yellow	8

[8] Are all A/D values on the printout within 3650 to 3850 units?



Advance to step 9.



Advance to step 10.

```

=====
LED NO. = 6
NO. STEPS= 0
NO. READS = 5
GREEN LED TEST
  3780
  3780
  3780
  3781
  3781

LED NO. = 7
NO. STEPS= 0
NO. READS = 5
RED LED TEST
  3780
  3780
  3780
  3781
  3781

LED NO. = 8
NO. STEPS= 0
NO. READS = 5
YELLOW LED TEST
  3780
  3780
  3780
  3781
  3781
=====
  
```

[9] To check the A/D reading for the Black Reference, do:

- Enter Option 16.
- Enter "9" to select "LED OFF".
- Enter "0" to select the number of steps.
- Enter "5" to select the number of readings.
- Are the A/D values on the printout -100 to + 100?



The adjustment is correct.
The procedure is completed.



Advance to step 10.

```

=====
LED NO. = 9
NO. STEPS= 0
NO. READS = 5
LED OFF TEST
  12
  11
  11
  12
  11
=====
  
```

To Adjust:

In steps 10 to 13, you will prepare the equipment for the adjustment.

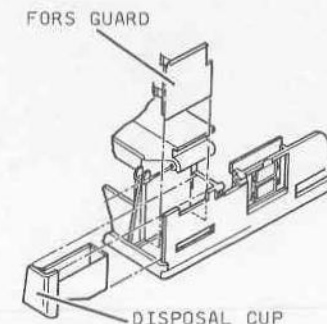
[10] Remove:

- DISPOSAL CUP
- FORS GUARD

NOTE

The MAIN COVER must be installed to avoid allowing excessive light into the reading area.

[11] Move the MAIN POWER SWITCH down to the "0" position.



[12] Connect the FORS ADJUSTMENT BOARD TL-3340 to the FORS ASSEMBLY.

NOTE

Check that the FORS ADJUSTMENT BOARD TL-3340 is installed correctly. Insert all of the PINS into the corresponding SOCKETS in the FORS ASSEMBLY. The PINS and the SOCKETS do not have any locating devices.

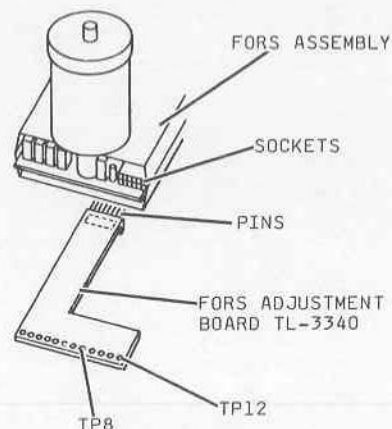
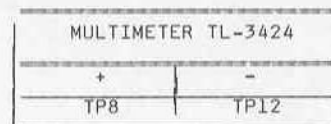
[13] Move the MAIN POWER SWITCH up to the "1" position and wait until the DT60 ANALYZER has initialized.

NOTE

Not all FORS BOARDS have POTENTIOMETER R25. If the equipment you are servicing does not have POTENTIOMETER R25, advance to step 17.

In steps 14 to 16 you will set POTENTIOMETER R25 at null to eliminate electrical interference in the next voltage measurements.

[14] Connect the MULTIMETER TL-3424 to the FORS ADJUSTMENT BOARD TL-3340.



[15] Enter the following options:

- Option 0, to deenergize all LEDs by canceling Options 6, 7, and 8.
- Option 2, to move the LOWER RACK to the position for a white reference reading.

NOTE

Option 2 must be entered before Option 74 is entered.

- Option 74, to move the LOWER RACK to the position for a black reference reading.

[16] Adjust POTENTIOMETER R25 until the voltage is -5.0 to +5.0 mV.

In steps 17 to 24, you will determine which LED has the lowest signal.

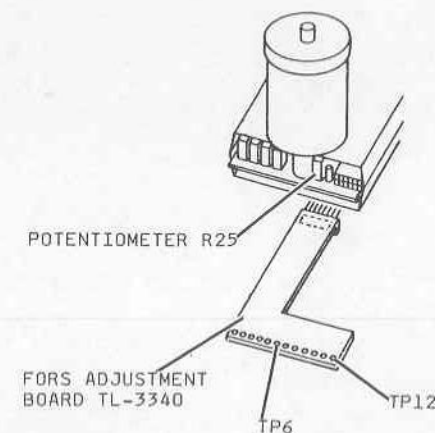
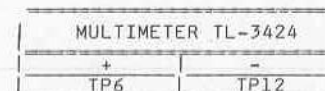
[17] Enter:

- Option 0, to reset the LOWER RACK
- Option 2, to move the LOWER RACK to the position for a white reference reading.

[18] Connect the MULTIMETER TL-3424 to the FORS ADJUSTMENT BOARD TL-3340:

NOTE

Use the lowest possible dc range on the MULTIMETER TL-3424.



[19] Do the following procedure for each LED:

- To energize an LED, enter the corresponding option. See the table below.
- Rotate the corresponding POTENTIOMETER fully clockwise.
- Record the maximum voltage measured for the energized LED.

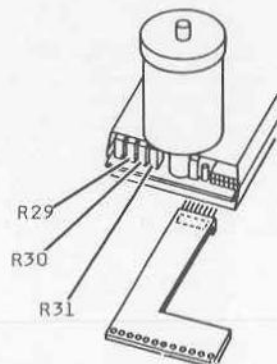
To select "LED COLOR":	Enter Option:	Adjust POTENTIOMETER:
Green	6	R31
Red	7	R29
Yellow	8	R30

[20] Compare the readings and determine which LED has the lowest voltage signal. Record the color of the LED and the voltage reading. You will use this information in steps 24 and 31.

[21] Are the recorded readings for each of the 3 LEDS more than 130 mV dc?



[22] Install and adjust a new FORS ASSEMBLY.



In steps 23 to 33, you have 2 objectives:

- In steps 23 to 26, you will set the gain of the AMPLIFIER with POTENTIOMETER R26.
- In steps 27 to 33, you will decrease the current through the LEDS until the voltage is less than the maximum. This action allows the reference circuit to increase the current as necessary without exceeding the maximum during the life of the LEDS.

First set the LED with the lowest reading, recorded in step 20. Adjust the voltage to 5.20 V. Then decrease the voltage by approximately 20%. POTENTIOMETER R26 is used to set the gain of the AMPLIFIER, using the LED with the lowest measured voltage. In steps 25 and 26, you will adjust POTENTIOMETER R26 to obtain a voltage of 5.20 V dc, and check to see if the reading is stable or has any variation of more than + .01 V. This is important because the voltage to the LEDS is not controlled by the reference circuit. The voltage might not remain stable. A small change in the input to the AMPLIFIER will cause a corresponding larger change in the output.

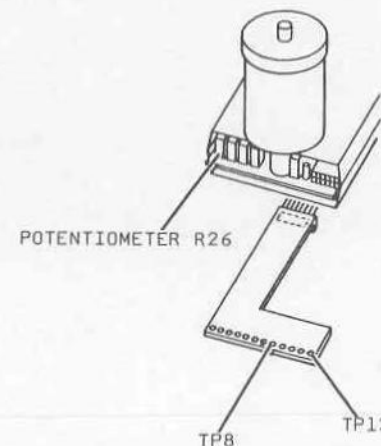
[23] Connect the MULTIMETER TL-3424:

MULTIMETER TL-3424	
+	-
TP8	TP12

[24] Do the following procedure only for the LED with the lowest reading, recorded in step 20:

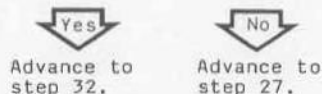
- Enter the option to energize the LED. See the Table below.
- Wait 30 seconds to allow the LED to become stable.

To select "LED COLOR":	Enter Option:
Green	6
Red	7
Yellow	8



[25] To adjust the gain, rotate POTENTIOMETER R26 until the voltage is 5.20. Allow the reading to become stable.

[26] Does the reading remain between 5.19 and 5.21 V dc?



NOTE

Clockwise rotation increases the voltage. Several rotations might be necessary to obtain the voltage.

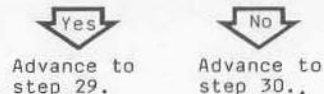
In steps 27 to 31, you will increase the voltage at TP4 to decrease the current through the LED with the lowest measured voltage. The voltage should be increased to approximately 20% less than the maximum current. This will allow the reference circuit to increase the current, without exceeding the maximum, when the LED's age and become dimmer. The voltage at TP4 increases as the current to the LED decreases.

Increasing the voltage by 1.0 V at TP4 corresponds to approximately 20% less current to the LED. A minimum voltage of 5.00 V dc prevents excessive current to the LED. Excessive current to the LED might decrease the life of the LED.

[27] Connect the MULTIMETER TL-3424 and record the voltage:

MULTIMETER TL-3424	
+	-
TP4	TP12

[28] Is the recorded voltage in step 26 less than 4.00 V dc?



[29] Do the following procedure:

- Enter the option to energize the LED with the lowest measured voltage. See the Table below.
- Wait 30 seconds to allow the LED to become stable.
- Rotate the corresponding POTENTIOMETER counterclockwise to obtain 5.00 V dc.
- Advance to step 31.

To select "LED COLOR":	Enter Option:	Adjust POTENTIOMETER:
Green	6	R31
Red	7	R29
Yellow	8	R30

[30] Do the following procedure:

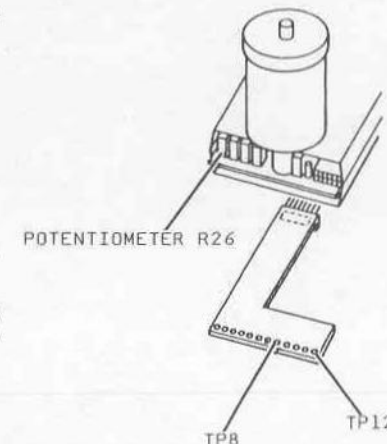
- Enter the option to energize the LED with the lowest measured voltage. See the Table above.
- Wait 30 seconds to allow the LED to become stable.
- Rotate the corresponding POTENTIOMETER counterclockwise until the voltage is 1.0 V more than the recorded voltage in step 27.
- Advance to step 31.

[31] Do the following procedure:

- Connect MULTIMETER TL-3424:

MULTIMETER TL-3424	
+	-
TP8	TP12

- Enter the option to energize the LED with the lowest measured voltage. See the table with step 29.
- Wait 30 seconds to allow the LED to become stable.
- Rotate POTENTIOMETER R26 to obtain a reading of 4.28 to 4.34 V dc.
- Advance to step 33.



In steps 32 and 33, you will decrease the voltage to the LEDS.
In step 32, the LED with the lowest measured voltage is decreased first.
Then in step 33, the other 2 LEDS are set.

[32] Do the following procedure only for the LED with the lowest reading, recorded in step 20:

- Connect the MULTIMETER TL-3424:

MULTIMETER TL-3424	
+	-
TP8	TP12

- Enter the option to energize the LED. See the table below.
- Wait 30 seconds for the LED to become stable.
- Rotate the corresponding POTENTIOMETER counterclockwise to obtain a voltage reading of 4.28 to 4.34 V dc.

To select "LED COLOR":	Enter Option:	Adjust POTENTIOMETER:
Green	6	R31
Red	7	R29
Yellow	8	R30

[33] Do the following procedure for each of the other 2 LEDS:

- Enter the option to energize the LED. See the Table above.
- Wait 30 seconds for the LED to become stable.
- Rotate the corresponding POTENTIOMETER counterclockwise to obtain a voltage reading of 4.28 to 4.34 V dc.

In steps 34 to 43, you will check that the voltages you set for each of the 3 LEDS produce a correct A/D signal. If not, you must do the adjustment again.

[34] Enter the following options:

- Option 0, to cancel the previous options.
- Option 2, to move the LOWER RACK to the position for a white reference reading.

[35] Execute option 16, and select:

- "6", to select the green LED
- "0", for the number of steps
- "5", for the number of readings.

[36] Check the printout and compare the results with the following specifications:

- The 5 readings are not within 10 A/D units of each other. If the results are not within this specification, install a new FORS ASSEMBLY.
- The value for each of the 5 readings should be 3690 to 3810 units. If the results are not within this specification, do the adjustment again.

LED NO. = 6
NO. STEPS = 0
NO. READS = 5
GREEN LED TEST
3780
3780
3780
3781
3781

[37] Enter option 16, and select:

- "7", to select the red LED
- "0", for the number of steps
- "5", for the number of readings.

[38] Check the printout and compare the results with the following specifications:

- The 5 readings are not within 10 A/D units of each other. If the results are not within this specification, install a new FORS ASSEMBLY.
- The value for each of the 5 readings should be 3690 to 3810 units. If the results are not within this specification, do the adjustment again.

[39] Enter option 16, and select:

- "8", to select the yellow LED
- "0", for the number of steps
- "5", for the number of readings.

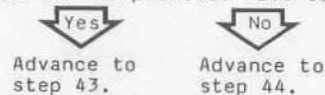
[40] Check the printout and compare the results with the following specifications:

- The 5 readings are not within 10 A/D units of each other. If the results are not within this specification, install a new FORS ASSEMBLY.
- The value for each of the 5 readings should be 3690 to 3810 units. If the results are not within this specification, do the adjustment again.

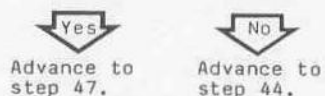
[41] To check the A/D reading for the Black Reference, do:

- Enter option 16
- Enter "9" to select "LED OFF".
- Enter "0" to select the number of steps.
- Enter "5" to select the number of readings.

[42] Are the A/D values on the printout -100 to +100?



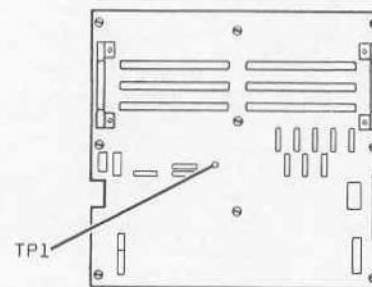
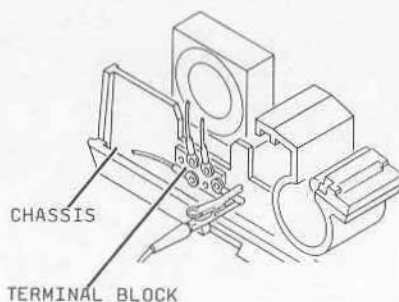
[43] Check the printout. Are the 5 readings are within 10 A/D units of each other?



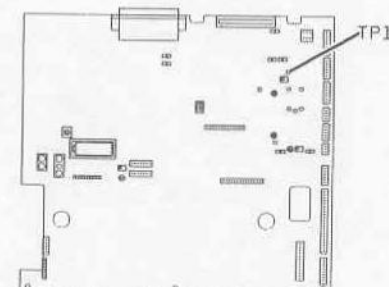
[44] Move the MAIN POWER SWITCH down to the "0" position.

[45] Connect the MULTIMETER TL-3424 and check the resistance:

MULTIMETER TL-3424		
+	Ground	Resistance
TERMINAL BLOCK	TP1 on MOTHER BOARD or CHASSIS	less than 1 ohm
TP12 on FORS BOARD	TP1 on MOTHER BOARD or MASTER BOARD	less than 1 ohm
TL-3340	MASTER BOARD	

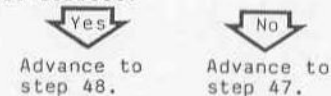


MOTHER BOARD



MASTER BOARD

[46] Is the resistance correct?



[47] See the Diagrams for the DT60 ANALYZER, Section 6, to diagnose and repair the malfunction. Then start this procedure again at step 30.

[48] Obtain more information from TAC before installing a new FORS ASSEMBLY.

[49] Enter option 0 to cancel all options.

[50] Remove the FORS ADJUSTMENT BOARD TL-3340.

[51] Install:

- FORS GUARD
- DISPOSAL CUP

IMPORTANT

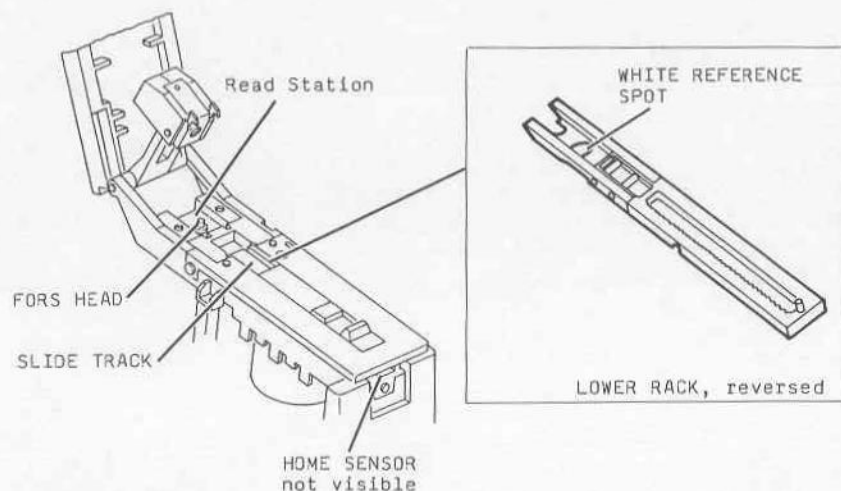
Calibration is not necessary unless a new FORS ASSEMBLY was installed. Adjusting the FORS ASSEMBLY does not change the calibration values.

HOME SENSOR and LOWER RACK — Alignment

Purpose:

The correct position of each colorimetric slide and of the WHITE REFERENCE SPOT on the LOWER RACK over the FORS HEAD is most important in obtaining accurate readings for the tests. The HOME SENSOR must be adjusted correctly to allow the following conditions to occur:

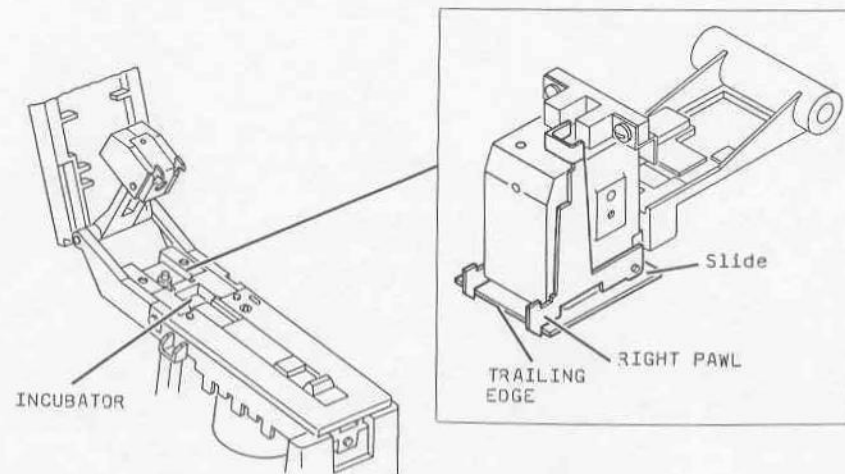
- during a slide reading cycle, the slide will be moved to given areas of the SLIDE TRACK within a given number of steps, and
- when a white reference reading is necessary, the WHITE REFERENCE SPOT will be in the correct position over the FORS HEAD.
- to decrease the occurrence of error codes F12, F13, and F19.



Specifications:

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at Step Count 86, and
- move down off the TRAILING EDGE of the slide at Step Count 87, 88, or 89.



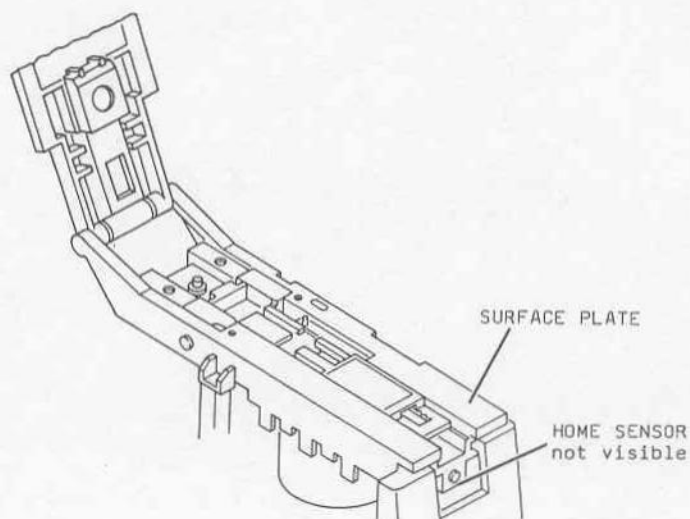
When to Do:

- Before adjusting the UPPER RACK.
- When Error Code F12, F13, or F19 occurs.
- When a procedure in the Diagnostics section indicates that adjusting the HOME SENSOR and LOWER RACK is necessary.
- When any of the following parts is installed:
 - HOME SENSOR
 - LOWER RACK
 - MECHANICAL MODULE ASSEMBLY
 - FORS WEIGHT ASSEMBLY
 - MOTOR AND PINION ASSEMBLY
 - HEATER ROD ASSEMBLY
 - THERMISTOR ASSEMBLY

Special Requirements:

The SURFACE PLATE must be installed when you do this adjustment.

The PHOTODSENSOR in the HOME SENSOR is sensitive to light. The installed SURFACE PLATE provides a dark environment to allow the HOME SENSOR to detect both the light beam when no FLAG is in the SENSOR, and an interruption of the light beam when the FLAG is in the home position. If the HOME SENSOR detects room light, correct adjustment might not be possible.



Special Materials:

CALIBRATION LABEL, Publication No. XP3100-28

Description:

To check before adjusting, you must:

- Place a slide in the INCUBATOR WELL.
- Execute Option 68, using the "Step Count" range to determine if an adjustment is necessary.

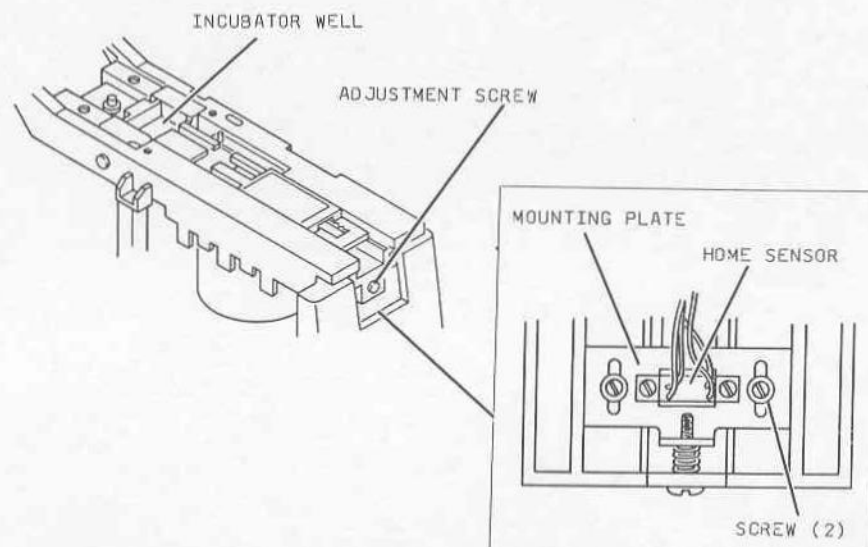
To obtain the correct adjustment, you must:

- Loosen the SCREWS on the MOUNTING PLATE for the HOME SENSOR.
- Adjust the ADJUSTMENT SCREW to move the HOME SENSOR.
- Execute Option 68 to check the adjustment.
- Tighten the SCREWS on the MOUNTING PLATE.
- Execute Option 68 again.

After adjusting the HOME SENSOR and LOWER RACK, you must:

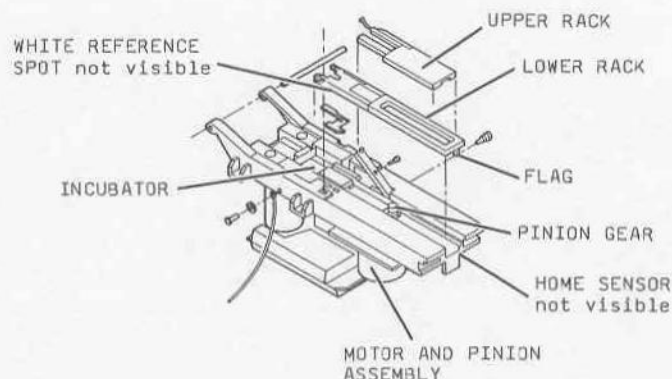
- Check that the UPPER RACK is adjusted correctly.
- Do the Option 16 Checkout Procedure.
- Do the DR Procedure.
- If the DR Procedure is not successful, adjust the FORS ASSEMBLY.

If the DR Procedure is successful, do the Correction Factors Procedure. Process Control Fluids for all colorimetric chemistries that use any LED or LEDs updated in the Correction Factors procedure. Calibrate for those chemistries as necessary.

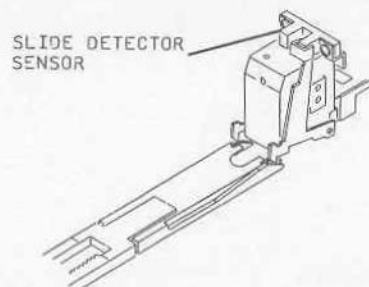


Additional Information:

The TRANSPORT MECHANISM moves slides and the WHITE REFERENCE SPOT to the correct positions during slide transport and slide reading. A PINION GEAR drives both RACKS, which are driven in opposite directions. The UPPER RACK moves the slides from the Spotting Station to the INCUBATOR, and the LOWER RACK moves them from the INCUBATOR to the Read Station. The WHITE REFERENCE SPOT is located on the bottom of the LOWER RACK, directly under the area that holds the slide for slide transport.

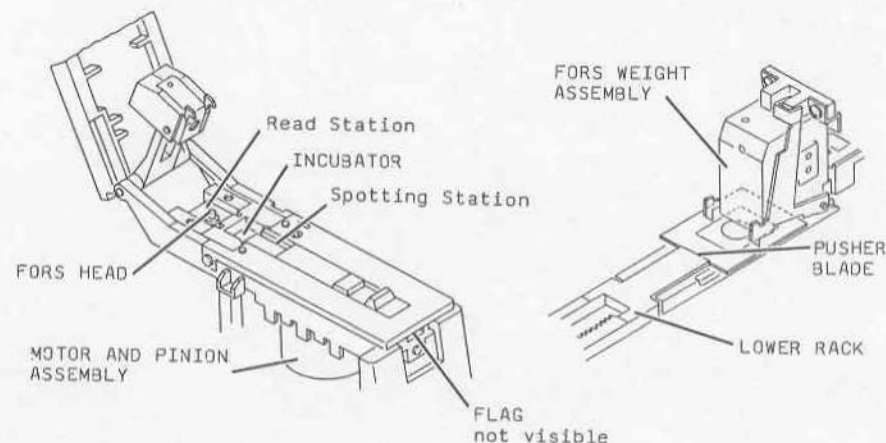


Software in the DT60 ANALYZER monitors the signals from the HOME SENSOR and the SLIDE DETECTOR SENSOR to determine the slide position. Using the data from the SENSORS, the software determines and sends command signals to the MOTOR AND PINION ASSEMBLY to move the UPPER RACK and the LOWER RACK for a given number of steps.

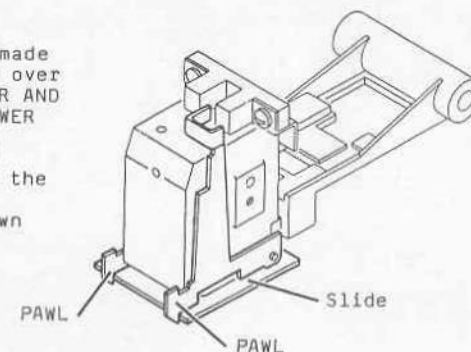


When the FLAG on the bottom of the LOWER RACK is inserted into the HOME SENSOR, the software recognizes this condition as the home-position and resets the step number to 0. When the MOTOR AND PINION ASSEMBLY drives the LOWER RACK backward from the home-position a given number of steps, the UPPER RACK moves forward and pushes the slide from the Spotting Station to the INCUBATOR. The software monitors the step numbers down from 0.

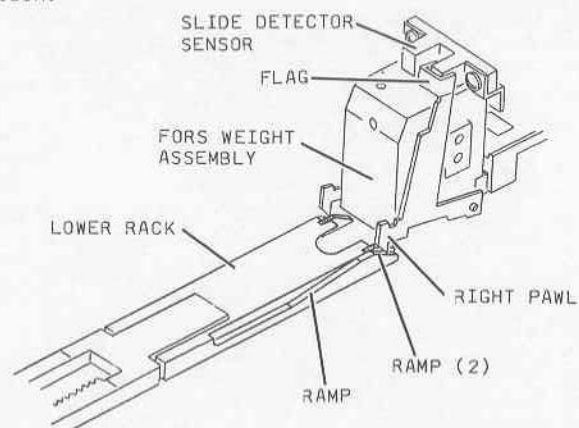
When the LOWER RACK is driven forward from the home-position for a given number of steps toward the Read Station, a PUSHHER BLADE on the LOWER RACK pushes the slide from the INCUBATOR to the Read Station under the FORS WEIGHT ASSEMBLY. The software monitors the step numbers up from 0.



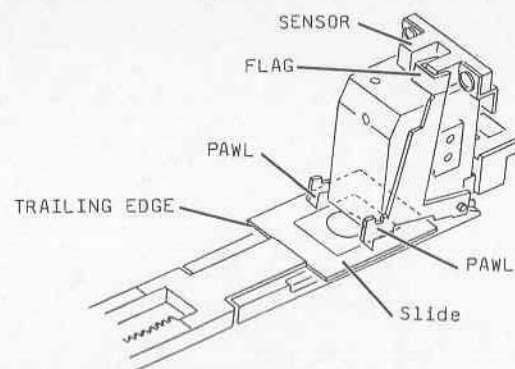
A white reference reading is made with the WHITE REFERENCE SPOT over the FORS HEAD. Then the MOTOR AND PINION ASSEMBLY drives the LOWER RACK backward. The slide is stopped against the PAWLS and remains in the position above the FORS HEAD. The FORS WEIGHT ASSEMBLY presses the slide down over the FORS HEAD.



The SLIDE DETECTOR SENSOR and the RIGHT PAWL in the FORS WEIGHT ASSEMBLY provide a system for monitoring the position of the slide. As the LOWER RACK moves toward the Read Station, 2 RAMPS on the LOWER RACK lift both PAWLS in the FORS WEIGHT ASSEMBLY. With or without a slide in position, a FLAG at the top of the RIGHT PAWL is inserted into the SLIDE DETECTOR SENSOR when the LOWER RACK moves under the FORS WEIGHT ASSEMBLY and lifts the PAWLS. When a slide is in position on the LOWER RACK, both PAWLS in the FORS WEIGHT ASSEMBLY move onto the top of the slide as the slide is moved to the Read Station.



If no slide is in position, another RAMP on the LOWER RACK allows the RIGHT PAWL to move down again, moving the FLAG down out of the SENSOR at step number +66. When a slide is in position, the FLAG should remain in the SENSOR until the PAWLS move down off the TRAILING EDGE of the slide, from step +87 to step +89.



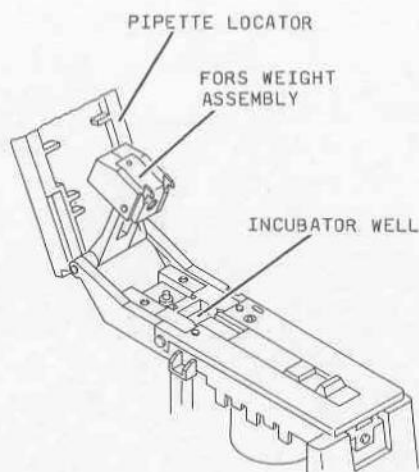
The status of the SLIDE DETECTOR SENSOR is Hi, or approximately +5.0 V dc, when the FLAG on the RIGHT PAWL is inserted into the SENSOR, and Lo, or approximately 0 V dc, when the FLAG is not inserted into the SENSOR. During the slide transport cycle, the diagnostic software expects a Hi signal, a Lo signal, or a change in the status of the signal for the SLIDE DETECTOR SENSOR. The expected signal conditions for the SLIDE DETECTOR SENSOR have corresponding conditions expected for given numbers of steps from the HOME SENSOR.

For example, the software expects that the SLIDE DETECTOR SENSOR is Hi at step +66. If the SLIDE DETECTOR SENSOR is Lo at step +66, error code F12 occurs. The SLIDE DETECTOR SENSOR will be Hi at step +66 if the SENSOR is adjusted correctly and if the slide lifts the RIGHT PAWL to place the FLAG into the SENSOR.

The diagnostic software then expects a change from Hi to Lo as the slide movement continues toward the Read Station. If the HOME SENSOR is adjusted correctly, the RIGHT PAWL should fall off the slide at step +87, +88, or +89. If the SLIDE DETECTOR SENSOR remains Hi at step +91, the software prepares to display error code F13. F13 will occur no later than step +94 if the Hi status continues.

To check before adjusting:

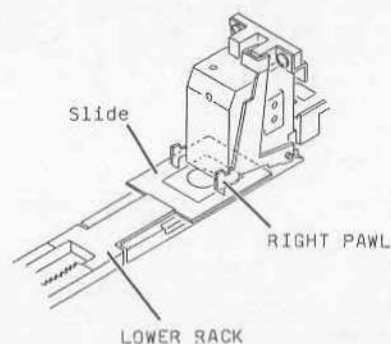
- [1] Enter Option 0 to reset the TRANSPORT MECHANISM.
- [2] Lift the PIPETTE LOCATOR and the FORS WEIGHT ASSEMBLY.
- [3] Place any slide into the INCUBATOR WELL.



In steps 5 to 11, you will check that the slide clears the RIGHT PAWL within 87 to 89 steps. First you will drive the LOWER RACK 86 steps toward the Read Station. If the slide does clear the PAWL, an adjustment is necessary to increase the distance between the HOME SENSOR and the Read Station.

If the slide does not clear the PAWL, you will advance the LOWER RACK one step at a time to a maximum of 3 additional steps. If the slide does not clear the RIGHT PAWL within 89 steps, an adjustment is necessary to decrease the distance between the HOME SENSOR and the Read Station.

- [4] Enter Option 68 and the number 86 to drive the LOWER RACK 86 steps toward the Read Station. Observe the RIGHT PAWL on the slide.



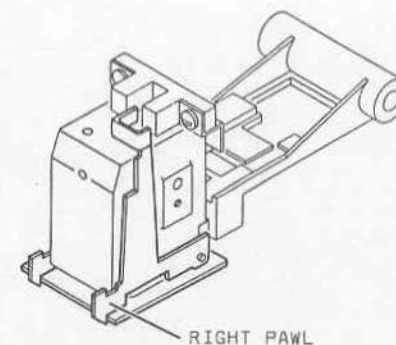
- [5] Did the RIGHT PAWL remain up on the slide after Option 68 was completed?



Advance to step 6.



Advance to step 12.



- [6] Execute Option 68 for 1 additional step of the MOTOR and check to see if the RIGHT PAWL moves down off the slide. The Step Count is 87.

- [7] Did the RIGHT PAWL move down off the TRAILING EDGE of the slide?



No adjustment is necessary.



Advance to step 8 of this procedure.

- [8] Execute Option 68 for 1 additional step of the MOTOR. The Step Count is 88.

- [9] Did the RIGHT PAWL move down off the slide?



No adjustment is necessary.



Advance to step 10 of this procedure.

- [10] Execute Option 68 for 1 additional step of the MOTOR. The Step Count is 89.

- [11] Did the RIGHT PAWL move down off the slide?



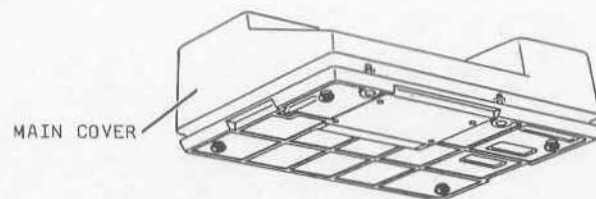
No adjustment is necessary.



Advance to step 12 of this procedure.

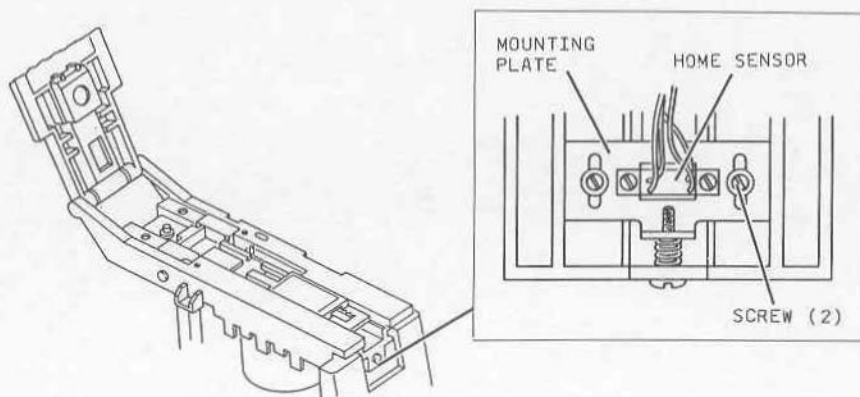
To adjust:

- [12] Remove the MAIN COVER.



- [13] Lift the front of the DT60 ANALYZER and locate the MOUNTING PLATE for the HOME SENSOR.

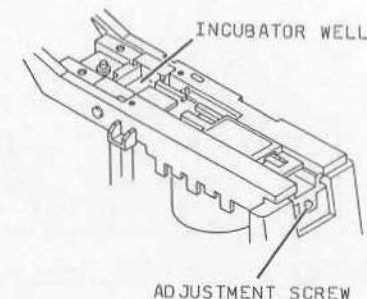
- [14] Loosen the 2 SCREWS that hold the MOUNTING PLATE.



NOTE

Use pressure when you rotate the ADJUSTMENT SCREW.

- [15] Rotate the ADJUSTMENT SCREW to move the HOME SENSOR.



If the PAWL moved down off the slide at or before Step Count 86 of the MOTOR AND PINION ASSEMBLY, rotate the ADJUSTMENT SCREW clockwise to increase the distance between the HOME SENSOR and the Read Station.

If the PAWL moved down off the slide after Step Count 89 of the MOTOR AND PINION ASSEMBLY, rotate the ADJUSTMENT SCREW counter-clockwise to decrease the distance between the HOME SENSOR and the Read Station.

To check after adjusting:

- [16] Enter Option 3 and the number 1 to operate the TRANSPORT MECHANISM for 1 cycle.

- [17] Place a slide into the INCUBATOR WELL.

- [18] Enter Option 68 and the number 86 to drive the LOWER RACK 86 steps toward the Read Station, and observe the RIGHT PAWL on the slide. The Step Count is 86.

[19] Did the RIGHT PAWL remain up on the slide after Option 68 was completed?



Advance to step 20.



Do step 15 again.

[20] Execute Option 68 for 1 additional step of the MOTOR and check to see if the RIGHT PAWL moves down off the edge of the slide. The Step Count is 87.

[21] Did the RIGHT PAWL move down off the slide?



Advance to step 24 of this procedure.



Advance to step 22 of this procedure.

[22] Execute Option 68 for 1 additional step of the MOTOR. The Step Count is 88.

[23] Did the RIGHT PAWL move down off the slide?



Advance to step 24 of this procedure.



Do step 15 again.

[24] Tighten the 2 SCREWS that hold the MOUNTING PLATE.

[25] Do steps 1 - 11 again to check that the adjustment is correct. If the adjustment is correct, advance to step 26.

[26] Check that the following adjustment is correct:

Adjustment
UPPER RACK

[27] Move the FORS WEIGHT ASSEMBLY and the PIPETTE LOCATOR ASSEMBLY down to the operating position.

[28] Install the MAIN COVER and tighten the 2 SCREWS.

[29] Do the following special procedure:

Special Procedure
Option 16 Checkout

[30] Are all A/D values within the correct ranges?



Advance to step 32.



Advance to step 31.

[31] Do the following adjustment:

Adjustment
FORS ASSEMBLY

[32] Do the DR Procedure for the software version corresponding to the software installed in the unit you are servicing.

[33] Is the DR Procedure successful?



This procedure is completed.



Advance to step 34.

[34] Calculate and update the black and white correction factors. See the Correction Factors Procedure for the software version corresponding to the software in the unit you are adjusting.

[35] If the correction factors for any LED or LEDs are updated, a full wet calibration should be done for any chemistries that use the updated LED.

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.

INCUBATOR — Temperature

Purpose:

To provide a controlled stable environment of 36.7 to 37.3°C (98 to 99°F) for the slides in the INCUBATOR.

Specifications:

The calculated average value of 3 high and 3 low temperatures measured at the Spotting Station must be 36.7 to 37.3°C (98 to 99°F).

When to Do:

When the results for BUN, AMYL, NH₃, and CREA are above specification, but the D_R procedure is successful. The results for these chemistries are affected by changes in the temperature of the INCUBATOR.

Special Tools and Materials:

MULTIMETER TL-3424
TEMPERATURE PROBE TL-2598
CALIBRATION LABEL, Publication No. XP3100-28

Special Requirements:

Before the temperature is measured, the following steps must be done:

- the MAIN COVER must be installed, and the 2 SCREWS must be fully tightened
- the SLIDE HANDLE ASSEMBLY must be pushed fully into the Spotting Station
- tape or other material must be used to make an air seal around the PIPETTE LOCATOR.

POTENTIOMETER: Multi-Board Configuration - R58 on the DRIVER BOARD
Single-Board Configuration - R73 on the MASTER BOARD

Description: To obtain the correct adjustment, you must:

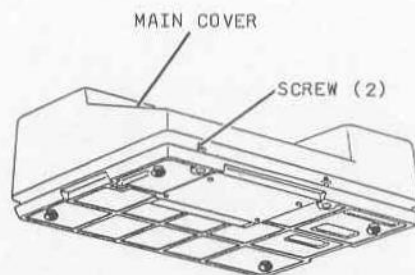
- Use the TEMPERATURE PROBE TL-2598 to measure the high and low temperatures for 3 heating cycles.
- Calculate the average value of the 6 measured temperatures.
- If the calculated average is not within the specifications, rotate the POTENTIOMETER to adjust the voltage in the circuit that controls the temperature of the INCUBATOR.
- To check the adjustment, measure the high and low temperatures for 3 additional heating cycles and calculate an average value.
- Process control fluids for the chemistries that are affected by changes in the temperature of the INCUBATOR. Calibrate for those chemistries as necessary.

IMPORTANT

This temperature adjustment might change the error limits for Error Codes H12, H13, and H14. Error Code H14, followed by H12 and/or H13, might occur during the first initialization after the temperature of the INCUBATOR is adjusted. Error codes at this time do not indicate a malfunction, but only that the old software limits are exceeded. To set new error limits, initialize the DT60 ANALYZER again until no "H" code occurs.

To Check:

- [1] Check that the MAIN COVER is installed correctly and the 2 SCREWS are fully tightened.
- [2] Allow the DT60 ANALYZER to remain energized with the MAIN COVER closed for a minimum of 15 minutes before doing the adjustment.



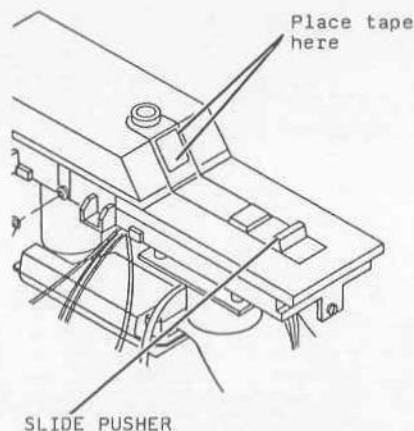
In software versions 9.0 and above the flow of air is changed to decrease the amount of ammonia gas remaining in the INCUBATOR. The new software causes the FAN to pull room air into the INCUBATOR around the PIPETTE LOCATOR. This air flow will cool the TEMPERATURE PROBE TL-2598 and cause the temperature reading to be too low. In steps 3 and 4 you will make an air seal for the area where the TEMPERATURE PROBE is inserted.

- [3] Move the SLIDE HANDLE ASSEMBLY fully into the Spotting Station to prevent air flow.

IMPORTANT

If tape is used, all adhesive residue must be cleaned from the PIPETTE LOCATOR after the tape is removed, to prevent ammonia contamination.

- [4] Use tape or other material to make an air seal around the PIPETTE LOCATOR.



- [5] Connect the TEMPERATURE PROBE TL-2598 to the MULTIMETER TL-3424.

NOTE

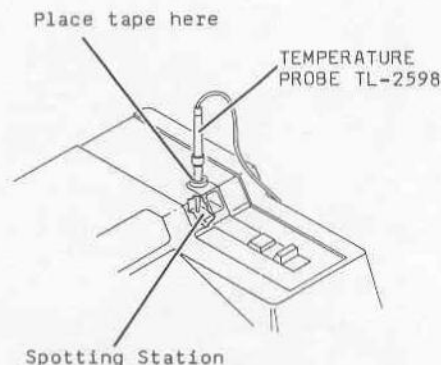
Set the MULTIMETER TL-3424 to the "mV" range.

The PROBE TL-2598 must be in the vertical position and must have full contact with the Spotting Station. If the PROBE TL-2598 does not have full contact with the surface of the Spotting Station, the temperature readings will not be correct.

- [6] Insert the PROBE TL-2598 into the top hole in the PIPETTE LOCATOR.

IMPORTANT

Place tape around the PROBE TL-2598 to decrease the air flow in this area.



The Spotting Station heats to a high temperature, then returns to a low temperature. A heating cycle is one range of low to high temperatures.

- [7] Observe 3 heating cycles and record the high and the low temperatures.
- [8] Calculate the average value of the 6 recorded temperatures.
- [9] Is the calculated value between 36.7 and 37.30C (98 to 990F)?



Advance to
step 17.



Advance to
step 10.

To Adjust:

[10] Remove the PROBE TL-2598.

[11] Remove the MAIN COVER.

IMPORTANT

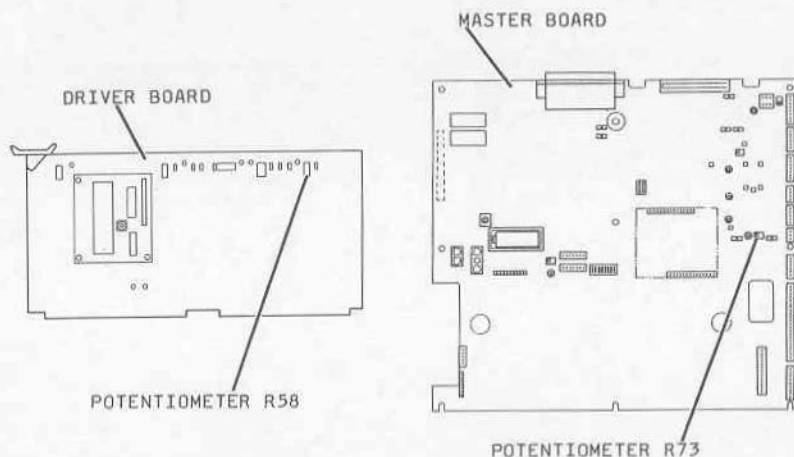
1 full rotation = approximately 0.2°C (0.3°F)

[12] Rotate the POTENTIOMETER to increase or decrease the temperature as necessary.
See the table, the information, and the figures below.

Multi-Board Configuration	Single-Board Configuration
R58 on the DRIVER BOARD	R73 on the MASTER BOARD

Multi-Board Configuration: Clockwise rotation decreases the temperature.

Single-Board Configuration: Counterclockwise rotation decreases the temperature.



[13] Install the MAIN COVER and tighten the 2 SCREWS.

[14] Wait 10 minutes.

[15] Insert the PROBE TL-2598 and close the opening around the PROBE again.

[16] Do steps 6 to 9 again to check that the adjustment is correct.

[17] Remove:
- TEMPERATURE PROBE TL-2598
- all tape or other material used to make an air seal.

[18] If necessary after the tape is removed, remove all adhesive from the surfaces of the DT60 ANALYZER.

[19] Return the DT60 ANALYZER to normal operating condition. Check for Error Codes H12, H13, and H14. If necessary, initialize the DT60 ANALYZER again until no "H" codes occur.

[20] If the temperature was adjusted, use Control Fluids and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them.

AMYL
BUN
CREA
NH₃

[21] If the results for any chemistry or chemistries indicate a "shift" in the values for the controls, a full wet calibration should be done.

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the call report. The customer should be asked read and sign the LABEL.

LC DISPLAY — Illumination

Purpose: To allow the DT60 ANALYZER to display information about the status of the DT60 ANALYZER with an optimum of contrast between the characters displayed on the LC DISPLAY, and the background of the LC DISPLAY. Optimum contrast makes the characters on the LC DISPLAY easy to read.

Specification: The characters on the LC DISPLAY should have optimum contrast and be easy to read.

POTENTIOMETER: Single-Board Configuration:

POTENTIOMETER R80 on the DRIVER BOARD

Multi-Board Configuration:

POTENTIOMETER R76 on the MASTER BOARD

To Check:

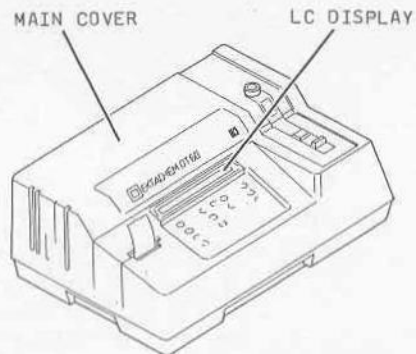
- [1] Check for optimum contrast between the characters on the LC DISPLAY and the background of the LC DISPLAY, and that the characters are easy to read.



The procedure is completed.



Advance to step 2.



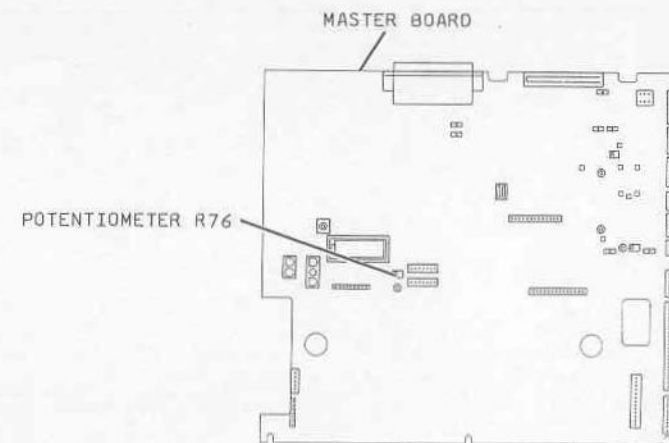
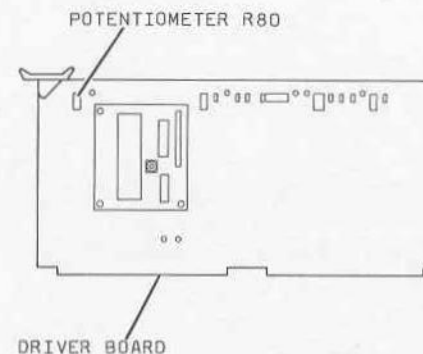
To Adjust:

- [2] Remove the MAIN COVER.

- [3] Rotate the POTENTIOMETER until the adjustment is correct:

- Single-Board Configuration: POTENTIOMETER R80 on the DRIVER BOARD
- Multi-Board Configuration: POTENTIOMETER R76 on the MASTER BOARD

- [4] Install the MAIN COVER.



LOWER ARM — Alignment

Purpose:

To adjust the LOWER ARM so that:

- it moves to the lowest possible position when the UPPER RACK and the LOWER RACK are in the home-position, but
- it is high enough that the LEADING EDGE of the UPPER RACK does not hit the PIN when the UPPER RACK moves toward the INCUBATOR.

On the newer configuration of the LOWER ARM, the larger diameter of the PIN prevents jams and no adjustment is possible or necessary.

Specifications:

- When the UPPER RACK is in the home-position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

When to Do:

- When a procedure in the Diagnostics section indicates that adjusting the LOWER ARM is necessary.
- When a replacement for the LOWER ARM is installed.
- When the LEADING EDGE of the PRESSURE PAD has damage.

Special Requirements:

Do the following adjustments before adjusting the LOWER RACK:

- HOME SENSOR/LOWER RACK
- UPPER RACK

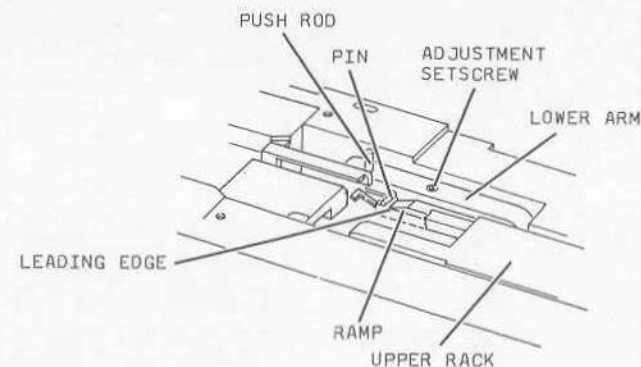
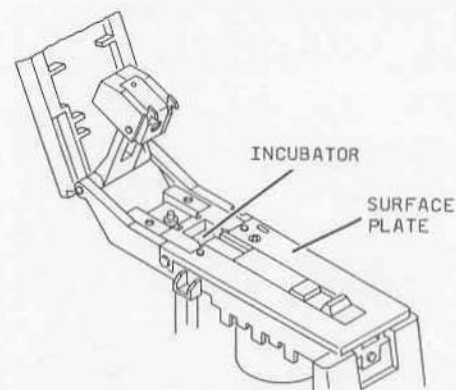
Do the following adjustment after adjusting the LOWER RACK:

- UPPER ARM

Description:

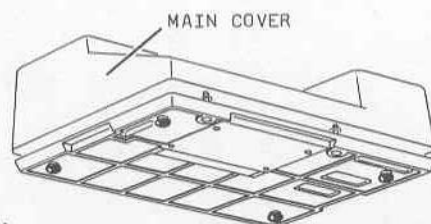
To obtain the correct adjustment on a LOWER ARM that has an ADJUSTMENT SETSCREW, you must:

- Remove any slides from the INCUBATOR.
- With the SURFACE PLATE removed, use option 3 to move the LOWER ARM through the full cycle. Check that the operation of the LOWER ARM is within the specifications.
- If necessary, remove the main power and rotate the ADJUSTMENT SETSCREW to adjust the position of the LOWER ARM and the clearance with the RAMP.
- Initialize the DT60 ANALYZER and check that the operation of the LOWER ARM is within the specifications.



To check

[1] Remove the MAIN COVER.

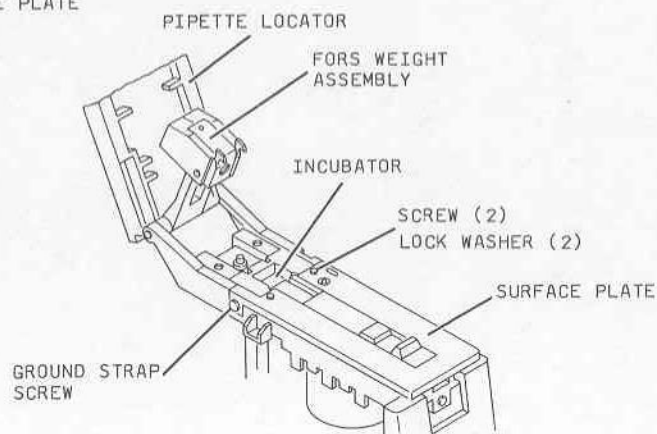


[2] Move the PIPETTE LOCATOR up.

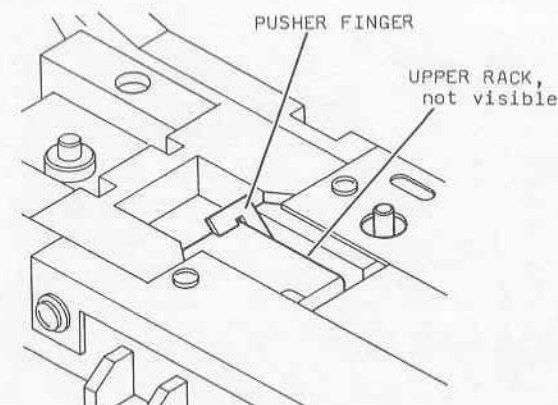
[3] Lift the FORS WEIGHT ASSEMBLY and remove any slides remaining in the INCUBATOR.

[4] Loosen or remove, as necessary, the GROUND STRAP SCREW.

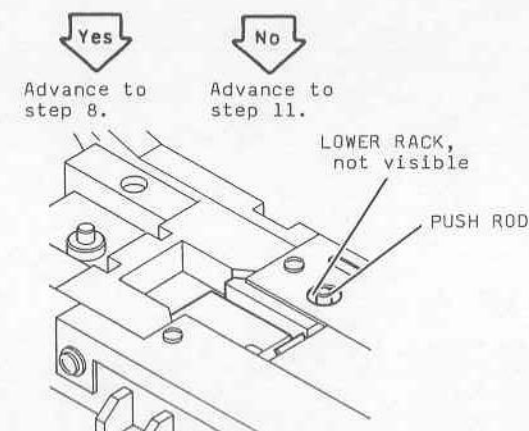
[5] Remove:
- 2 SCREWS
- 2 LOCK WASHERS
- SURFACE PLATE



[6] Execute option 3 for 5 cycles to operate the TRANSPORT MECHANISM. Check that the PUSHER FINGER on the UPPER RACK is moved smoothly between the home-position and the INCUBATOR.



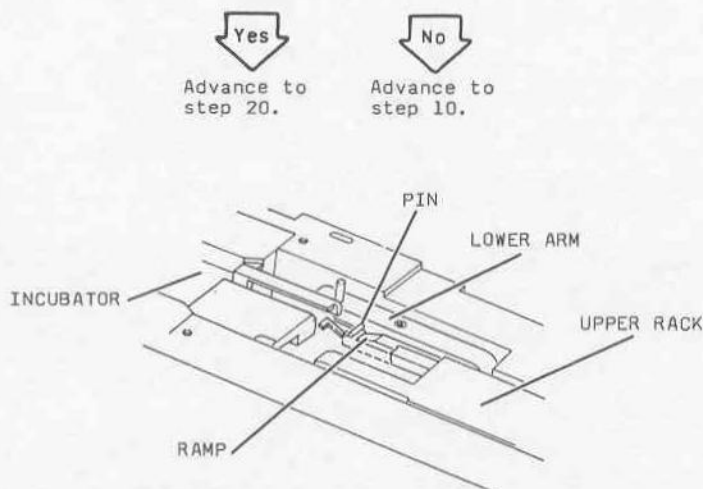
[7] Check that the PUSH ROD on the LOWER ARM is at the lowest point of travel when the initialization of the TRANSPORT MECHANISM is completed.



NOTE

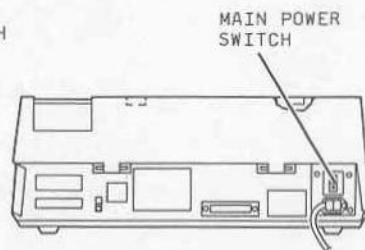
Do not remove the UPPER RACK.

- [8] Enter option 1 and observe the motion of the UPPER RACK toward the INCUBATOR.
- [9] Does the RAMP smoothly engage, but not hit, the PIN on the LOWER ARM, and do the PIN and the LEADING EDGE of the UPPER RACK have minimum clearance when the UPPER RACK is in the home position?



To adjust:

- [10] Press the MAIN POWER SWITCH to the "0" position.

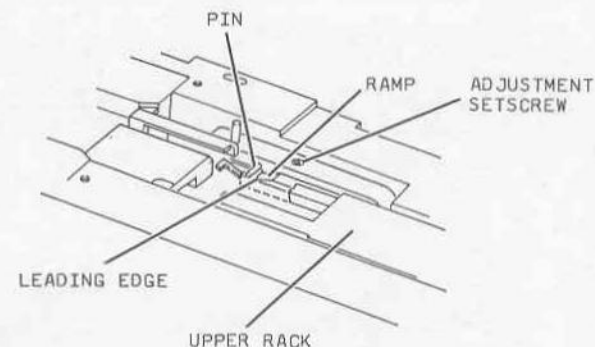


- [11] Manually move the UPPER RACK until the LEADING EDGE of the RAMP is under the PIN on the LOWER ARM. In this position the RAMP should have minimum clearance with the PIN.

- [12] To adjust the position of the LOWER ARM for minimum clearance, rotate the ADJUSTMENT SETSCREW.

NOTE

Counterclockwise rotation moves the LOWER ARM down and decreases the clearance.

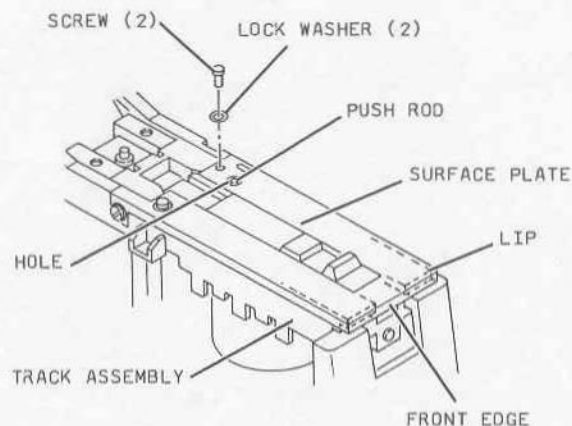


- [13] Manually move the UPPER RACK in both directions and check:
 - the LOWER ARM is lifted smoothly when the UPPER RACK moves toward the INCUBATOR, and
 - the LEADING EDGE of the RAMP does not hit the PIN.

- [14] Do steps 11 - 13 again as necessary.

• CAUTION •

Check that you seat the SURFACE PLATE correctly before installing the LOCK WASHERS and the SCREWS. The FRONT EDGE of the SURFACE PLATE should be installed over the LIP of the TRACK ASSEMBLY, and the PUSH ROD should be in the center of the HOLE. See the illustration.



- [15] Install:
- SURFACE PLATE
 - 2 LOCK WASHERS
 - 2 SCREWS

[16] Install or tighten, as necessary, the GROUND STRAP SCREW.

[17] Press the MAIN POWER SWITCH to the "1" position.

[18] When the TRANSPORT MECHANISM initializes, check that the PUSHER FINGER on the UPPER RACK is moved smoothly between the home position and the INCUBATOR.

[19] Check that the PUSH ROD is at the lowest point of travel when the TRANSPORT MECHANISM has completed the cycles.



Advance to
step 20.



Do steps 6
to 19 again.

[20] Move the PIPETTE LOCATOR down.

- [21] Install:
- MAIN COVER
 - 2 SCREWS

[22] Return the DT60 ANALYZER to normal operation.

PRINTER — Character Density

Purpose: The THERMAL PRINTER on the DT60 ANALYZER has a PRINT HEAD that is energized for an adjustable time. POTENTIOMETER VR101 on the PRINTER INTERFACE BOARD controls the time. The printout becomes darker as the POTENTIOMETER is set higher. The maximum time is 170 microseconds, but this setting would provide excessive power to the PRINT HEAD, and cause damage to it. The optimal operation would be a maximum of 100 microseconds. This setting will provide acceptable character printout, and a safe life to the PRINT HEAD.

In this procedure you must carefully observe the quality of the printout to know when the optimum setting is reached. The "." character in the printout is actually made of 4 small dots. The quality of this character printout will indicate when the correct setting is reached.

It is important to understand that the adjustment specification can only be determined when the ANALYZER has the paper available from the Kodak catalog. FEs can obtain this paper as a special tool, by ordering TL-3889. If the customer uses paper from other manufacturers, the correct setting for the Kodak paper might provide a printout that is too light on other papers. You can then recommend that the customer use only the paper available from Kodak.

Specification: Using paper available from Kodak, the 4 dots in the "." character must be separate.

When to Do:

- After installing a new THERMAL PRINTER
- After installing a new PRINTER INTERFACE BOARD.
- When the printout quality requires adjustment.

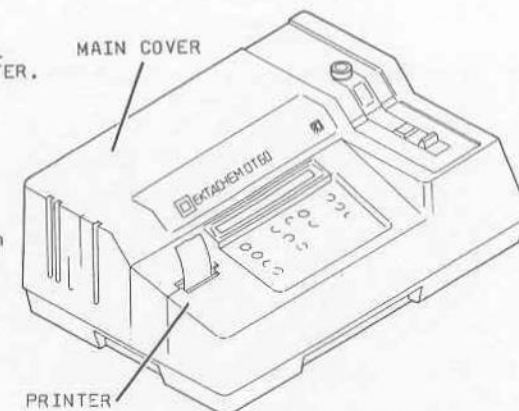
Special Requirement: Paper available from Kodak must be loaded in the PRINTER.

Special Tools: MAGNIFIER TL-1442
THERMAL PAPER TL-3889

POTENTIOMETER: VR101, on the PRINTER INTERFACE BOARD

To Check:

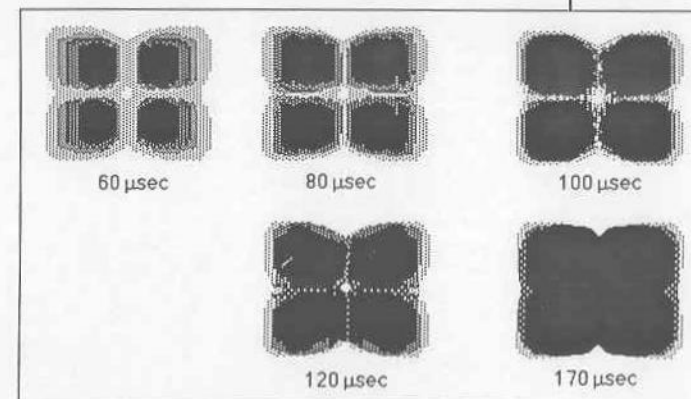
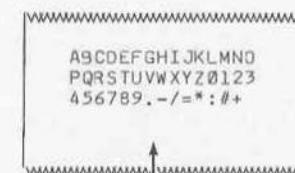
- [1] If necessary, load THERMAL PAPER TL-3889 in the PRINTER.
- [2] Remove the MAIN COVER.
- [3] To obtain a printout, execute option 4.
- [4] Use MAGNIFIER TL-1442 to check the "." character on the printout.
- [5] Comparing the printout with the figure, does the printout density correspond to 100 microseconds or less?



The adjustment is correct.
Advance to step 8.



Advance to step 6.

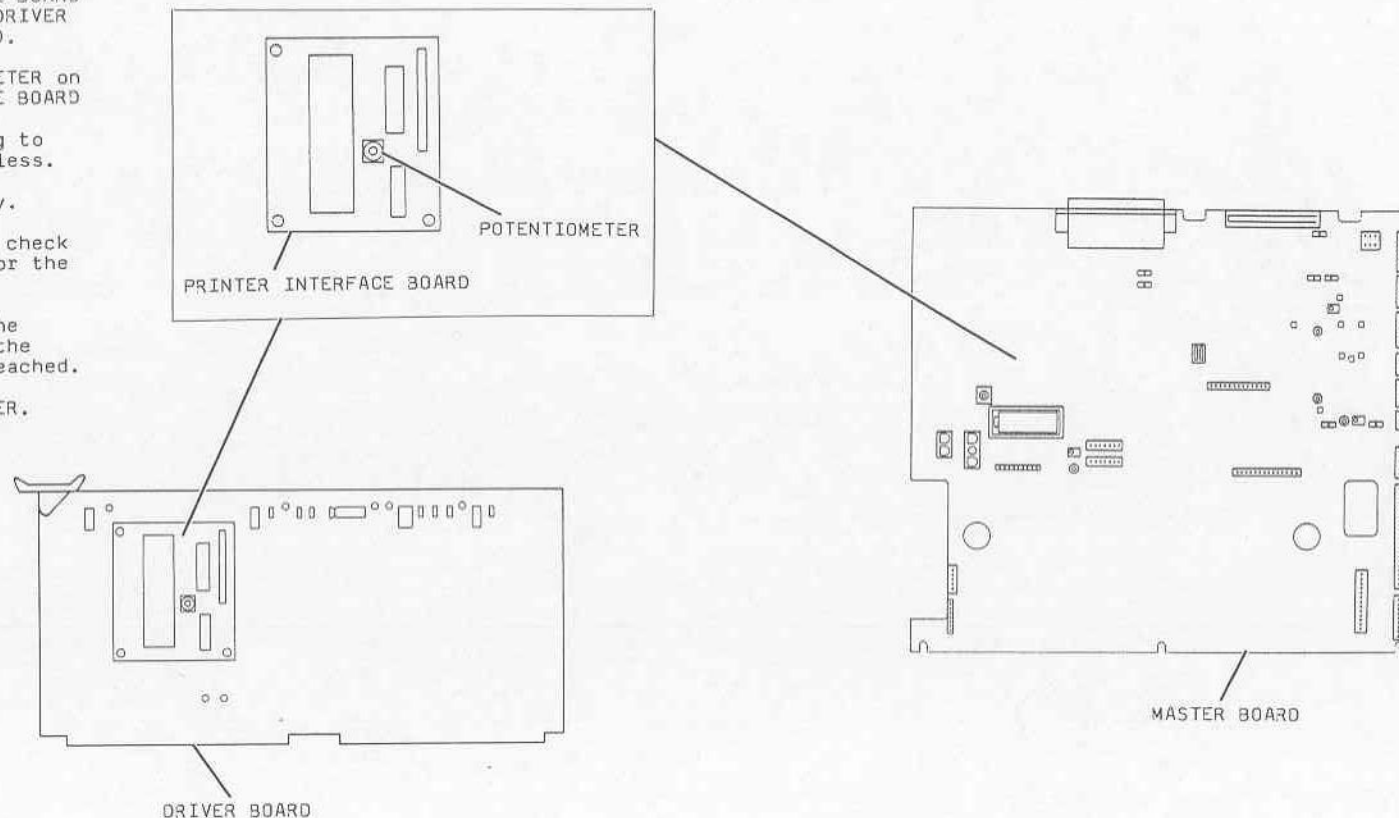


To Adjust:

NOTE

The PRINTER INTERFACE BOARD is connected to the DRIVER BOARD or MASTER BOARD.

- [5] Rotate the POTENTIOMETER on the PRINTER INTERFACE BOARD to obtain a printout density corresponding to 100 microseconds or less. Clockwise rotation increases the density.
- [6] Execute option 4 and check the printout again for the correct density.
- [7] Continue adjusting the POTENTIOMETER until the correct density is reached.
- [8] Install the MAIN COVER.

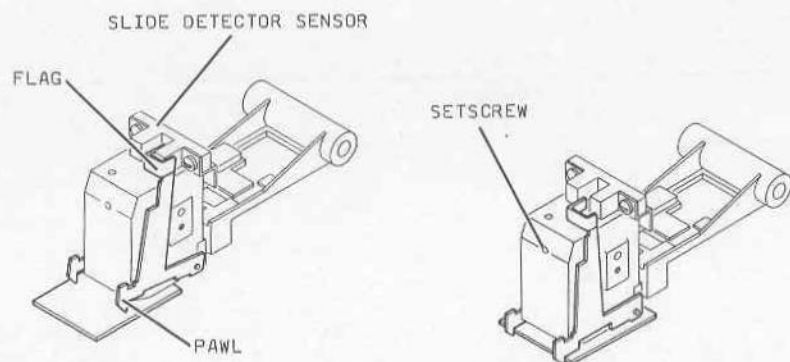


SLIDE DETECTOR SENSOR — Alignment

Purpose:

A light beam is projected between the two parts of the SLIDE DETECTOR SENSOR. The FLAG breaks the light beam when the right PAWL is lifted. After a slide leaves the INCUBATOR, it moves under the PAWLS on the FORS WEIGHT ASSEMBLY. The slide lifts the right PAWL, causing the FLAG to enter the SLIDE DETECTOR SENSOR. When the slide is staged, the PAWL drops, and the FLAG exits the SLIDE DETECTOR SENSOR. The system monitors this sequence to determine if a slide is correctly positioned over the FORS ASSEMBLY for the reading.

The position of the SLIDE DETECTOR SENSOR must be adjusted with the SETSCREW to make it sensitive to the motion of the FLAG. When the SENSOR detects the FLAG, the "SLIDE" LED on the DRIVER BOARD or the DS4 LED on the MASTER BOARD should energize.



Slide under PAWLS. FLAG enters SLIDE DETECTOR SENSOR.

Slide staged in Read Station. FLAG exits SLIDE DETECTOR SENSOR.

Specifications:

The specification cannot be measured without doing the adjustment procedure. With a slide under the PAWLS, rotate the SETSCREW until the "SLIDE" LED or DS4 LED first energizes. Then rotate the SETSCREW an additional 1.5 rotations counterclockwise.

When To Do:

- When indicated in the diagnostics for errors in the Slide Transport System.
- After installing a new SLIDE DETECTOR SENSOR.
- After installing a new FORS WEIGHT.

Description:

To check the adjustment of the SLIDE DETECTOR SENSOR, you must:

- Check that the circuit to the LED operates correctly.
- Execute option 68 for 66 steps to move a slide under the PAWLS.
- Check that the LED energizes.
- Execute option 68 for 25 additional steps to continue moving the slide toward the Read Station and to allow the RIGHT PAWL to fall from the slide.
- Check that the LED deenergizes.

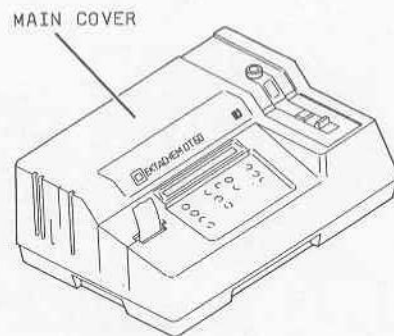
To do the adjustment, you must:

- Rotate the SETSCREW to obtain the specification.
- Check the LED for the correct signal.

To Check:

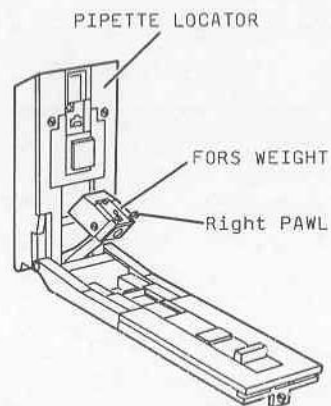
In steps 1 to 5, you will check that the circuit and the LED operate correctly.

- [1] Remove the MAIN COVER.



- [2] Lift the PIPETTE LOCATOR.

- [3] Lift the FORS WEIGHT a minimum amount and hold the right PAWL up.



IMPORTANT

In Multi-Board configuration, check the "SLIDE" LED on the DRIVER BOARD.

In Single-Board configuration, check LED DS4 on the MASTER BOARD.

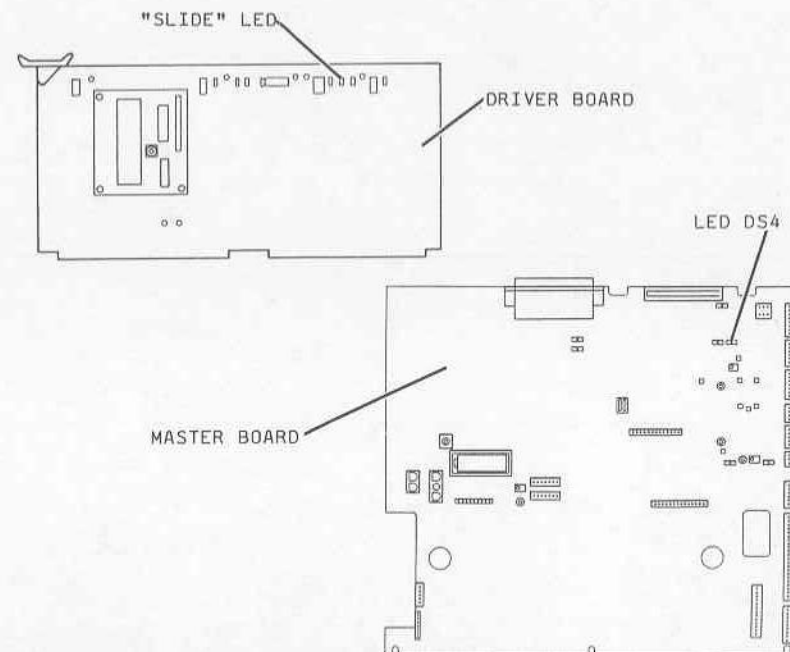
- [4] Check that the LED correctly indicates the status of the SLIDE DETECTOR SENSOR. With the PAWL up, the FLAG is in the SENSOR. The LED should be energized.
- [5] Allow the RIGHT PAWL to move down and check that the LED deenergizes.
- [6] Did the LED correctly indicate the status of the SLIDE DETECTOR SENSOR in steps 4 and 5?



Advance to
step 8.



Advance to
step 7.



- [7] Use the diagrams to check for a malfunction in the "Slide Present Sensor Circuit". This procedure is completed.

In steps 8 to 17, you will check to determine if an adjustment is necessary.

- [8] Enter option 3 and select 1 cycle to reset the TRANSPORT MECHANISM.

- [9] Lift the PIPETTE LOCATOR.

- [10] Move the FORS WEIGHT down.

- [11] Place a slide in the INCUBATOR.

- [12] Move the PIPETTE LOCATOR down.

- [13] To move the slide under the PAWLS, execute option 68 for 66 steps.

IMPORTANT

The illustration indicates the SHROUD removed from the FORS WEIGHT. Do not remove the SHROUD during this procedure.

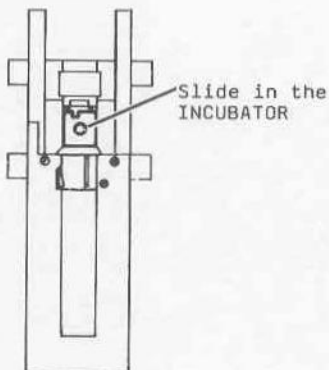
- [14] Check that the LED energizes when the slide is under the PAWL.



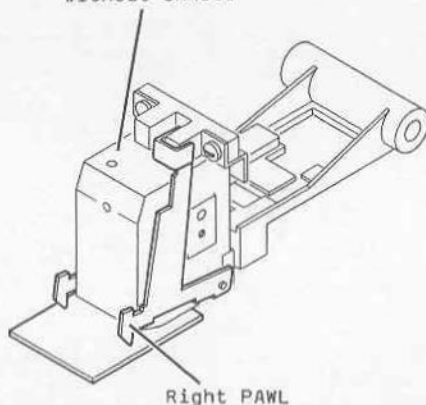
Advance to step 15.



Advance to step 18.



FORS WEIGHT
without SHROUD



If the LED flickers when you tap the TRACK ASSEMBLY, the SLIDE DETECTOR SENSOR could produce an intermittent signal.

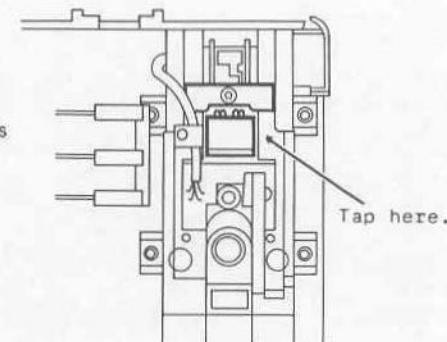
- [15] Tap the TRACK ASSEMBLY. Does the LED flicker?



Advance to step 18.



Advance to step 16.



- [16] To move the slide beyond the PAWLS, execute option 68 for 25 steps. The slide should clear the PAWLS.

- [17] Did the LED deenergize?



Advance to step 18.



Advance to step 19.

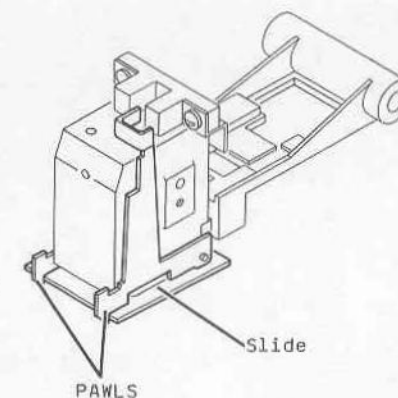
- [18] Tap the TRACK ASSEMBLY. Does the LED flicker?



Advance to step 19.



Adjustment is correct. Procedure completed.



To Adjust:

[19] Lift the PIPETTE LOCATOR.

[20] Place a slide in the INCUBATOR.

[21] Move the PIPETTE LOCATOR down.

[22] To move the slide under the PAWLS, execute option 68 for 66 steps.

NOTE

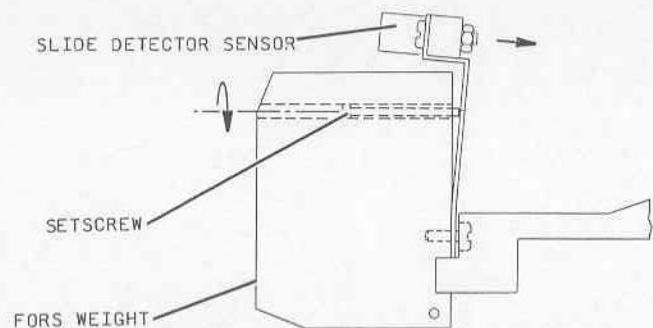
The PIPETTE LOCATOR should remain up.

[23] Lift the PIPETTE LOCATOR.

[24] Rotate the SETSCREW counterclockwise until the end of the SETSCREW is not visible at the back of the FORS WEIGHT.

In step 25 you will move the SETSCREW to find the position where the FLAG first enters the SENSOR.

[25] With the PAWLS on the slide, slowly rotate the SETSCREW clockwise, at the same time tapping the FORS WEIGHT. Stop when the LED flickers.



In step 26 you will rotate the SETSCREW an additional distance to provide an optimum adjustment.

[26] Rotate the SETSCREW counterclockwise 1.5 rotations. The LED should now be energized.

[27] Enter option 0.

[28] Install the MAIN COVER.

SPOT DETECTOR SENSOR — Voltage

Purpose:

The SPOT DETECTOR SENSOR has an LED that projects a light beam onto the web of the slide in the Spotting Station. Some of this light is reflected back up to the SENSOR, causing a voltage signal which is monitored by the computer. When a drop of fluid is dispensed onto the slide, the reflectance is changed, causing the voltage signal to change. This change in voltage is a signal that the sample drop has been dispensed, and that the slide is ready to move to the INCUBATOR.

POTENTIOMETER R32 on the DRIVER BOARD, or POTENTIOMETER R35 on the MASTER BOARD, sets the gain for the voltage signal. The objective of this adjustment is to set an optimum gain so that the system can detect the signal change when it occurs.

The webs in different types of slides have different reflectances. The range of reflectances for wet colorimetric slides, from lightest to darkest, is:

NH3/CREA	-----	Lightest
GLU		
TRIG		
URIC, AMYL, Hg		
TBIL		
TP	-----	Darkest

When you check the operation of the SPOT DETECTOR SENSOR, check the reflectance from the lightest and darkest slides that the customer has.

Specification:

The voltage for the SPOT DETECTOR must be +5.50 to +6.00 V dc.

When To Do:

- When the slide is not moved to the INCUBATOR after the drop of fluid is dispensed from the DT PIPETTE onto the slide.
- When the system advances a slide before the drop of fluid is dispensed.
- After installing a new SPOT DETECTOR SENSOR.

Special Tools:

MULTIMETER TL-3424
WHITE REFERENCE SLIDE TL-3344

Test Points:

For Multi-Board Configuration:

MULTIMETER TL-3424	
+	-
TP 4 on the DRIVER BOARD	TP 1 on the MOTHER BOARD

For Single-Board Configuration:

MULTIMETER TL-3424	
+	-
TP 3 on the MASTER BOARD	TP 10 on the MASTER BOARD

POTENTIOMETERS:

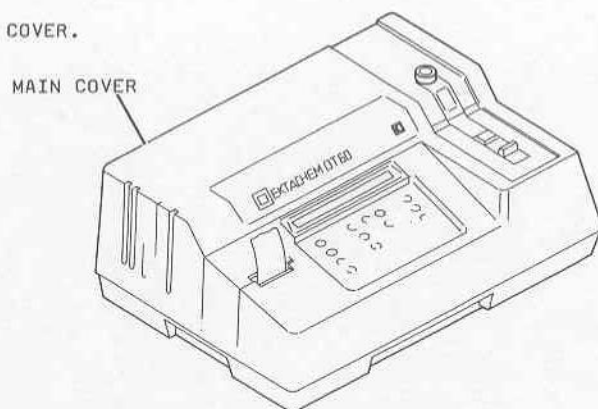
For Multi-Board Configuration - R32 on the DRIVER BOARD
For Single-Board Configuration - R35 on the MASTER BOARD

Description: To adjust the SPOT DETECTOR SENSOR, you must:

- Insert the WHITE REFERENCE SLIDE TL-3344 and check the voltage.
- Rotate the POTENTIOMETER to obtain the correct voltage.
- Process light and dark slides with fluid and check that the SPOT DETECTOR operates correctly.

To Check:

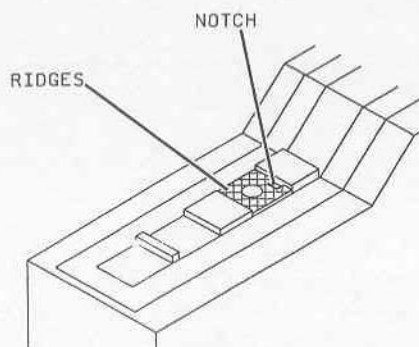
- [1] Remove the MAIN COVER.



- [2] Insert the WHITE REFERENCE SLIDE TL-3344, with the NOTCH in the front right corner.

NOTE

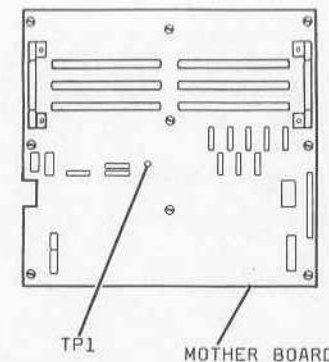
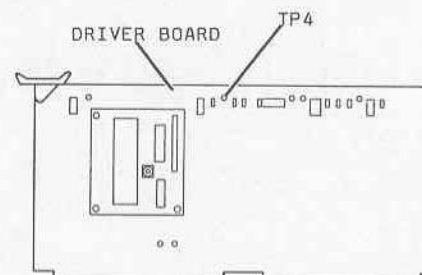
The bottom of the slide will be up so that the RIDGES are on the top.



- [3] Connect the MULTIMETER TL-3424 and check that the voltage is +5.50 to +6.00 V dc.

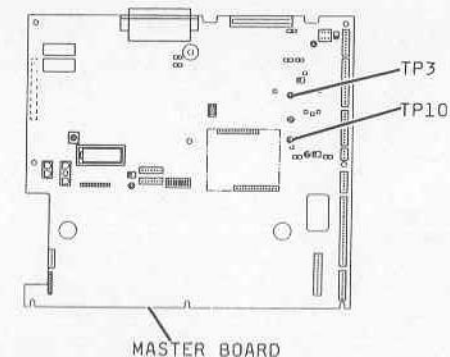
For Multi-Board Configuration:

MULTIMETER TL-3424	
+	-
TP4 on DRIVER BOARD	TP1 on MOTHER BOARD



For Single-Board Configuration:

MULTIMETER TL-3424	
+	-
TP3 on MASTER BOARD	TP10 on MASTER BOARD



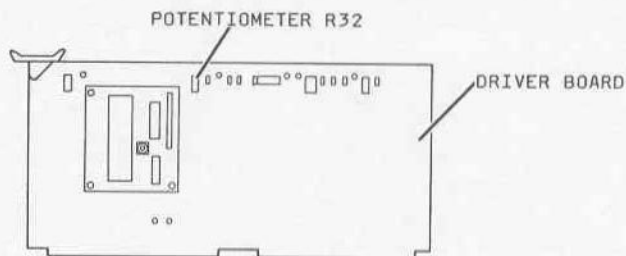
[4] Is the voltage correct?



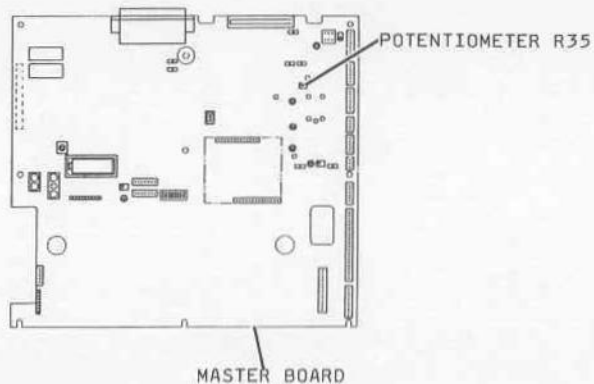
To Adjust:

[5] Rotate the POTENTIOMETER that adjusts the voltage of the SPOT DETECTOR SENSOR until the voltage is +5.50 to +6.00 V dc.

For Multi-Board Configuration: Rotate POTENTIOMETER R32 on the DRIVER BOARD.



For Single-Board Configuration: Rotate POTENTIOMETER R35 on the MASTER BOARD.



Checkout for Correct Adjustment:

[6] Remove the WHITE REFERENCE SLIDE TL-3344.

[7] Disconnect the MULTIMETER TL-3424.

[8] Install the MAIN COVER.

[9] Do the following procedure to check for correct operation:

- Select light and dark sample slides.

NH3/CREA	-----	Lightest
GLU		
TRIG		
URIC, AMYL, Hg		
TBIL		
TP	-----	Darkest

- Dispense serum or control fluid onto the slides and check that the SPOT DETECTOR detects a change in voltage operates correctly.

[10] If the SPOT DETECTOR does not operate correctly, do steps 1 to 4 again. Adjust the voltage as necessary and do steps 5 to 9 again.

TIP SEAT — Height

Purpose:

Slides absorb a dispensed drop at an exact rate. The PIPETTE will provide a uniform dispense rate, but if the distance from the TIP to the slide is not correct, the drop will not have the correct shape. The drop will not spread smoothly over the surface of the slide, or part of the drop will adhere to the TIP.

Specification:

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3346. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

When To Do:

- After removing and installing the PIPETTE LOCATOR COVER.
- After installing a new TIP SEAT or PIPETTE LOCATOR.
- When the results for the following tests are not within the limits for the DT60 ANALYZER, or when a "shift" occurs in the results for these chemistries processed with Control Fluids.

HDLC

TP

TRIG

Changes in the height adjustment of the TIP SEAT might cause changes in the results for these chemistries.

Special Tools and Materials:

TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PIPETTE ADJUSTMENT WRENCH TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

CALIBRATION LABEL, Publication No. XP3100-28

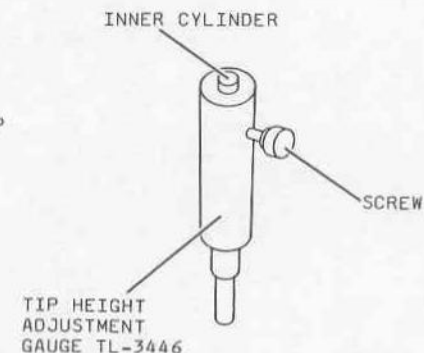
Description: To obtain the correct adjustment:

- Insert TIP HEIGHT ADJUSTMENT GAUGE TL-3446 to check the adjustment.
- To obtain the correct adjustment, use a tool to rotate the TIP SEAT.
- Process control fluids for the chemistries that are affected by changes in the height of the TIP SEAT. Calibrate for those chemistries as necessary.

To Check:

- [1] Remove any slide from the Spotting Station.

- [2] Loosen the SCREW on the TIP HEIGHT ADJUSTMENT GAUGE TL-3446 until the INNER CYLINDER moves without obstruction.



- [3] Insert the TIP HEIGHT ADJUSTMENT GAUGE TL-3346 into the PIPETTE LOCATOR.

- [4] Determine if the INNER CYLINDER and OUTER CYLINDER are flush to within 0.051 mm (0.002 in.).

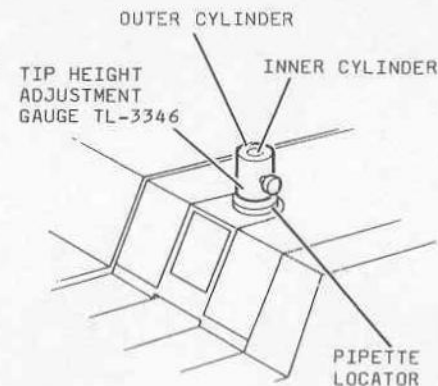


Advance to step 5.



Advance to step 6.

- [5] Remove the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The procedure is completed.



To Adjust:

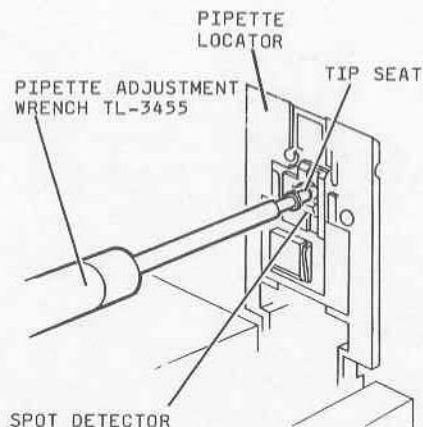
- [6] Remove the TIP HEIGHT
ADJUSTMENT GAUGE TL-3446.

- [7] Lift the PIPETTE LOCATOR.

.....
• CAUTION •
.....

Do not cause damage to the
SPOT DETECTOR SENSOR.

- [8] Insert the PIPETTE ADJUSTMENT
WRENCH TL-3455 or a HEX
WRENCH into the TIP SEAT.



- [9] Rotate the PIPETTE ADJUSTMENT WRENCH TL-3455 clockwise to
increase the height of the TIP SEAT, or counterclockwise to
decrease the height of the TIP SEAT.

NOTE

Clockwise rotation increases the height of the TIP SEAT.
Counterclockwise rotation decreases the height of the TIP SEAT.

- [10] If the TIP SEAT is very loose, apply SEALANT TL-2425 to the
threads.
- [11] Remove the PIPETTE ADJUSTMENT WRENCH TL-3455.
- [12] Move the PIPETTE LOCATOR down.
- [13] Do steps 3 and 4 again to check the adjustment.
- [14] If the height of the TIP SEAT was adjusted, use Control Fluids
and process slides for any calibrated chemistries that are
sensitive to the height of the TIP SEAT.
- [15] If the results for any chemistry or chemistries indicate a
"shift" in the values for the controls, a full wet calibration
should be done.

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION
LABEL, Publication No. XP3100-28, must be applied to the call
report. The customer should be asked read and sign the LABEL.

UPPER ARM — Height

Purpose:

To adjust the UPPER ARM so that the PRESSURE PAD is lifted the correct distance and at the correct time when the slide is moved into the INCUBATOR. The PRESSURE PAD must be lifted above the level of the TRACK to allow the slide to move freely into the INCUBATOR. The PRESSURE PAD should be lifted at the correct point during the forward motion of the LOWER RACK. If the PRESSURE PAD is not lifted soon enough, a jam might occur between the slide and the PRESSURE PAD when the slide is moved into the INCUBATOR.

The PRESSURE PAD should not be lifted too soon, because the function of the PRESSURE PAD is to cover and press together the slides in the INCUBATOR. The PRESSURE PAD is an important part of the temperature control system for the colorimetric slides.

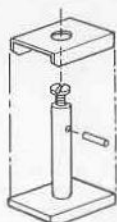
Specifications:

- When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

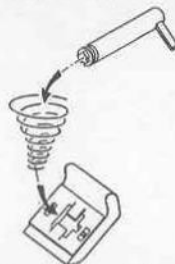
NOTE

For a type 1 PRESSURE PAD, the step count is 20.
For a type 2 PRESSURE PAD, the step count is 70.

Type 1
PRESSURE PAD
ASSEMBLY



Type 2
PRESSURE PAD
ASSEMBLY



- With the RACKS in the home position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

When to Do:

- When a new PRESSURE PAD is installed.
 - When the PRESSURE PAD is damaged on the leading edge.
- NOTE: First install a replacement for the PRESSURE PAD.
- When the test results for chemistries that are sensitive to variations in the temperature of the INCUBATOR are not correct, or when the results for slides processed with Control Fluid have problems with precision or accuracy. An error in the adjustment of the UPPER ARM might cause problems with the results for the following chemistries:

AMYL BUN CREA Hb NH₃

Special Materials:

CALIBRATION LABEL, Publication No. XP3100-28

Description:

To obtain the correct adjustment:

- Use option 0 to reset the RACKS.
- Use option 68 and check that the PIN has minimum clearance with the UPPER ARM. Select 20 steps if the PRESSURE PAD is type 1, and 70 steps if it is type 2.
- Reset the RACKS again.
- With a slide in the INCUBATOR WELL, move the PIPETTE LOCATOR down to the operating position and check that the PRESSURE PAD is moved up by the slide.
- If adjustment is necessary, rotate the SETSCREW.

To check the DT60 ANALYZER following the adjustment:

- Check the specifications again.
- Reset the RACKS.
- Process control fluids for the chemistries that are sensitive to changes in the temperature of the INCUBATOR. Calibrate for those chemistries as necessary.

To Check:

[1] Lift the PIPETTE LOCATOR.

[2] Remove:

3 SCREWS
PIPETTE LOCATOR COVER

[3] Check to see if a Type 1 or Type 2 PRESSURE PAD is installed.

[4] Move the PIPETTE LOCATOR down to the operating position.

[5] Enter option 0 to reset the UPPER RACK and the LOWER RACK.

[6] To move the TRANSPORT MECHANISM, enter option 68.
For a Type 1 PRESSURE PAD, enter the number 20, for 20 steps.
For a Type 2 PRESSURE PAD, enter the number 70, for 70 steps.

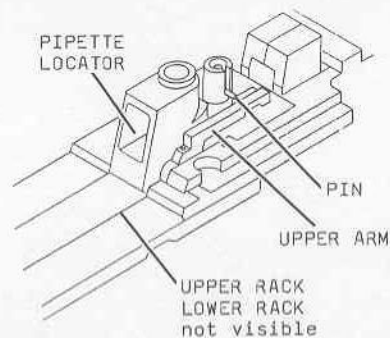
[7] Does the UPPER ARM touch, but not lift, the PIN?



Advance to
step 8.



Advance to
step 12.



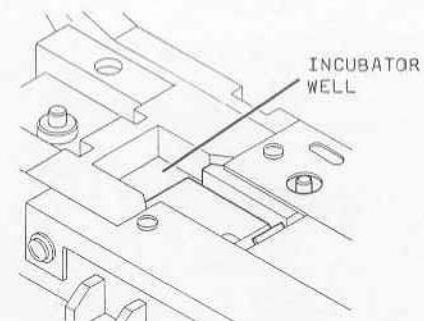
UPPER ARM - Height
XP3100-14

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[8] Enter option 0, to reset the UPPER RACK and the LOWER RACK.

[9] Lift the PIPETTE LOCATOR and place a slide in the INCUBATOR WELL.



[10] Observe the top of the PRESSURE PAD SHAFT while you move the PIPETTE LOCATOR slowly down to the operating position.

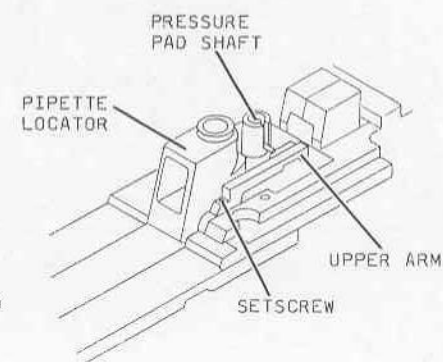
[11] Is the PRESSURE PAD lifted when the PIPETTE LOCATOR is moved down?



Advance to
step 15.



Advance to
step 12.



UPPER ARM - Height
XP3100-14

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To Adjust:

[12] Lift the PIPETTE LOCATOR.

[13] To adjust the position of the UPPER ARM, rotate the SETSCREW.

NOTE

Clockwise rotation moves the UPPER ARM up.

[14] To check the adjustment, do steps 4 - 11 again.

.....
• CAUTION •
.....

Do not tighten the 3 SCREWS with excessive force. Excessive tightening could change the focus of the BAR CODE READER or cause a bind in the UPPER ARM.

[15] Install:

PIPETTE LOCATOR COVER
3 SCREWS

[16] Move the PIPETTE LOCATOR down to the operating position.

[17] Enter option 0, to reset the UPPER RACK and the LOWER RACK.

[18] Because the PIPETTE LOCATOR COVER was removed and installed, check that the following adjustment is correct:

Adjustment
TIP SEAT - Height

[19] If the UPPER ARM was adjusted, use Control Fluids and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them.

AMYL
BUN
CREA
Hb
NH₃

[20] If the results for any chemistry or chemistries indicate a "shift" in the values for the controls, a full wet calibration should be done.

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the call report. The customer should be asked read and sign the LABEL.

UPPER RACK — Alignment

Purpose:

The PUSHER FINGER on the UPPER RACK engages a slide and moves it from the Spotting Station to the INCUBATOR. When the slide motion is correct, the slide falls flush with the bottom of the INCUBATOR. The PUSHER FINGER must be able to move the slide completely into the INCUBATOR, but if the UPPER RACK moves too far, it can hit the bottom of the INCUBATOR. This condition can cause the RACKS to bind, or errors in the step counts. These conditions can cause slide transport errors or frequent slide jams.

To check the adjustment, options 3 and 68 will be used to move the RACKS to a given position. Then you will check the distance from the PUSHER FINGER to the INCUBATOR and compare it with the expected distance. When an adjustment is necessary, you will move the entire MOTOR AND PINION ASSEMBLY and the attached RACKS to adjust the position of the PUSHER FINGER.

Specification: Execute option 68 for -59 steps, and measure 0.152 to 0.584 mm (0.005 to 0.023 in.) between the PUSHER FINGER and the INCUBATOR.

Special Requirements: The LOWER RACK/HOME SENSOR adjustment must be correct before doing this procedure.

Special Tools: FEELER GAUGES TL-1384 or TL-2372

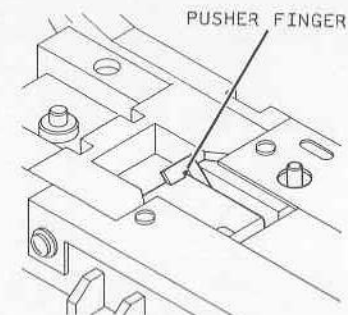
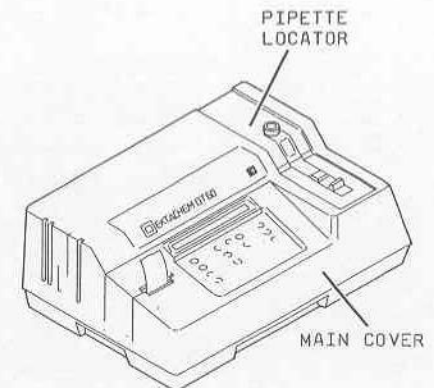
Decription:

To do this procedure, you must:

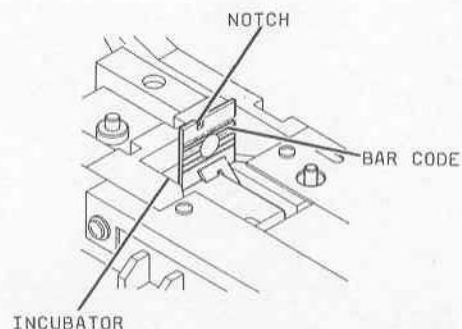
- Use options 3 and 68 to set the position of the RACKS.
- Check the distance between the PUSHER FINGER and the INCUBATOR.
- If necessary, adjust the position of the MOTOR BRACKET.
- Use option 3 to reset the RACKS.
- Use option 68 to check the distance again if an adjustment was made.

To Check:

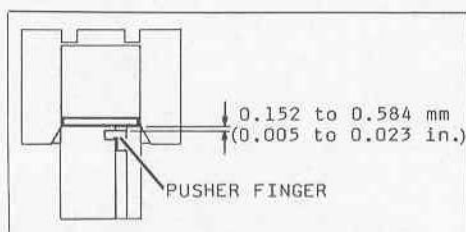
- [1] Remove the MAIN COVER.
- [2] Check that the LOWER RACK is adjusted correctly before you begin this procedure. See the adjustment procedure for HOME SENSOR and LOWER RACK.
- [3] Move the PIPETTE LOCATOR down.
- [4] To move the RACKS to the home position, and to move the PUSHER FINGER down, execute option 3 for 2 cycles.
- [4] Lift the PIPETTE LOCATOR.
- [5] To move the PUSHER FINGER toward the INCUBATOR, execute option 68 for -59 steps.



- [6] Place a slide in the INCUBATOR, with the NOTCH up, and the BAR CODE adjacent to the PUSHER FINGER. See the illustration.



- [7] Holding the slide tightly against the front of the INCUBATOR, use FEELER GAUGES TL-1384 or TL-2372 to measure the distance between the slide and the PUSHER FINGER.



The PUSHER FINGER can move up and cause an error in the measurement. Press the PUSHER FINGER down to check that it is in the correct position.

- [8] Is the distance 0.152 to 0.584 mm (0.005 to 0.023 in.)?



Advance to step 9.



Advance to step 10.

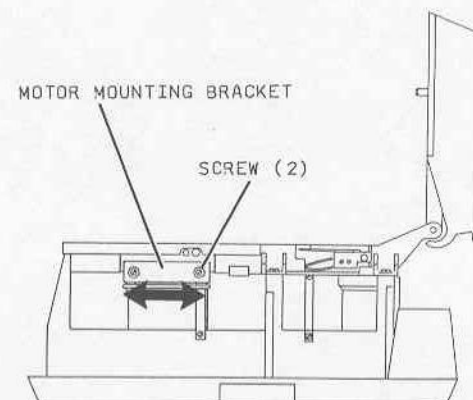
- [9] The adjustment is correct.

- Remove the slide.
- Install the MAIN COVER.
- Execute option 0 to reset the RACKS.

To Adjust:

In steps 10 to 12 you will move the MOTOR MOUNTING BRACKET to obtain the correct distance. Move the BRACKET only 1/2 the distance necessary. The PUSHER FINGER is adjusted 2 times the distance that the BRACKET is moved.

- [10] Loosen the 2 SCREWS that hold the MOTOR MOUNTING BRACKET.



- [11] To obtain the correct specification, move the MOTOR MOUNTING BRACKET forward or backward 1/2 the necessary distance.

- [12] Tighten the 2 SCREWS.

Final Checkout:

- [13] Do steps 4 to 9 again.
- [14] To reset the RACKS, execute option 3 for 2 cycles.
- [15] To move the PUSHER FINGER toward the INCUBATOR, execute option 68 for -59 steps.
- [16] Put the slide in the INCUBATOR and check for the correct distance.

Special Procedures

Applying CONTACT LUBRICANT TL-3773

Purpose: To provide protection from corrosion of the PINS in the following CONNECTORS:

BROWNOUT BOARD to POWER SUPPLY
P25/J25 on the POWER SUPPLY
P23/J23 on the MOTHER BOARD

After the CONTACT LUBRICANT is applied, it should not be necessary to apply it again for 5 to 10 years. You will write "TL-3773" and the date on the HIGH VOLTAGE LABEL to indicate to other FEs when the CONTACT LUBRICATE was applied.

When to Do:

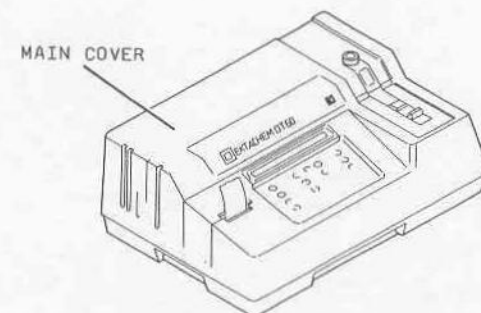
- On the next service call for all DT60 ANALYZERS when you do not find the date and "TL-3773" on a LABEL on the POWER SUPPLY GUARD.
- After installing a new POWER SUPPLY.
- When diagnosing error codes D12, D13, D16, and D19.

Special Tool: CONTACT LUBRICANT TL-3773

Description: To apply CONTACT LUBRICANT TL-3773 correctly, you must:

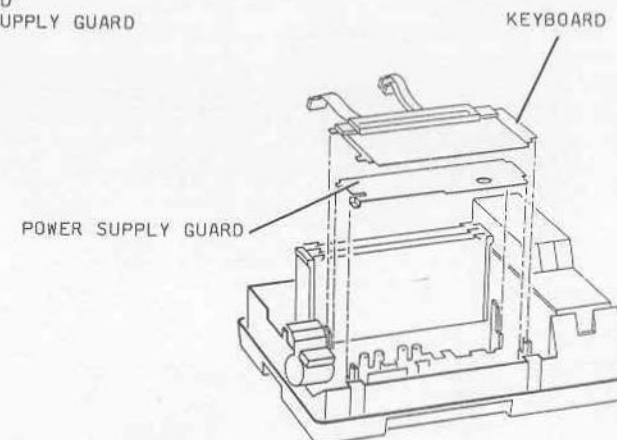
- Clean the PINS by disconnecting and connecting the BROWNOUT BOARD and CONNECTORS J23 and J25.
- Apply a minimum amount of TL-3773 to the top half of all PINS. See the illustration.
- Write the tool number "TL-3773" and the date on the LABEL on the POWER SUPPLY GUARD.

[1] Remove the MAIN COVER.



[2] Remove:

- KEYBOARD
- POWER SUPPLY GUARD



 • CAUTION •

Removing and installing parts excessively can cause damage to the PINS.

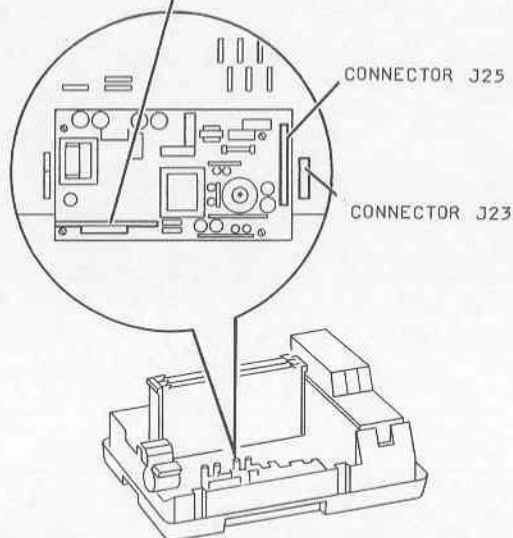
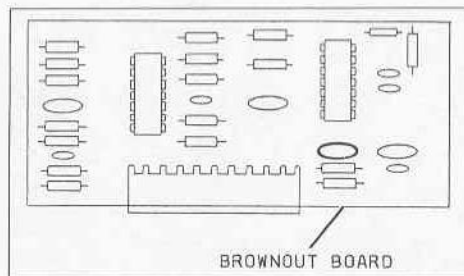
- [3] To remove the BROWNOUT BOARD, move it from side to side and then at the same time pull it up.

The friction from removing and seating the PINS cleans the contact surfaces.

- [4] Install the BROWNOUT BOARD and remove it again to clean the PINS.

- [5] Disconnect and connect CONNECTORS J23 and J25 to clean the PINS.

- [6] Remove the CONNECTORS again.



 • CAUTION •

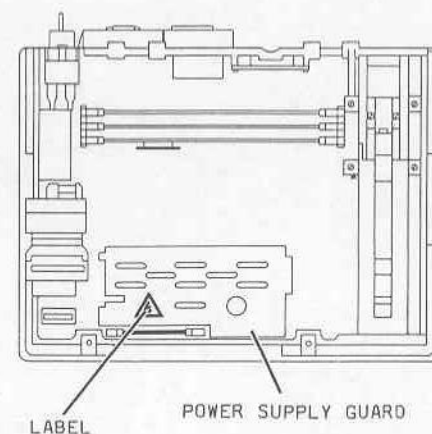
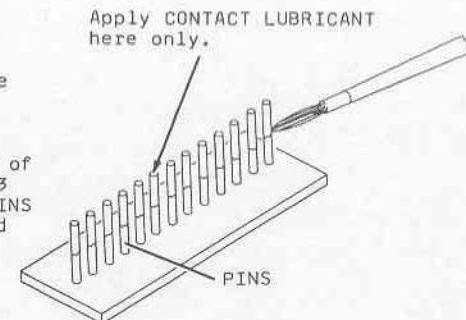
If too much CONTACT LUBRICANT TL-3443 is applied, it can attract dust which can damage the connection.

- [7] Apply a minimum quantity of CONTACT LUBRICANT TL-3773 to the top half of the PINS on the BROWNOUT BOARD and CONNECTORS.

- [8] Install:

- BROWNOUT BOARD
- CONNECTORS

- [9] Write "TL-3773" and the date on the "High Voltage" LABEL. The LABEL is installed on the POWER SUPPLY GUARD.



Applying CONTACT LUBRICANT TL-3773

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Applying CONTACT LUBRICANT TL-3773

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Correction Factors Procedure

Versions 9.0 and 10.7 Software

Purpose:

The optical system of each DT60 ANALYZER has unique characteristics that influence the reading results. The Correction Factors procedure is used to provide uniform results from one ANALYZER to another. Correction factors are used to relate the internal black and white readings taken in the ANALYZER to given values for black and white reference determined from special slides. The BLACK REFERENCE SLIDE TL-3345 and WHITE REFERENCE SLIDE TL-3344 are used to provide standard reflectances. The reflectance of these slides is measured with high precision in a laboratory, and the results are given on the LABEL of the slide box. Reflectance values for green, red, and yellow are given, corresponding to the 3 LED colors in the ANALYZER. In this procedure, you will manually enter these reflectance values into the memory of the ANALYZER. Then the ANALYZER will take readings of the tool slides, for each LED color. From this data, the computer will calculate a correction factor curve that relates the ANALYZER readings to the given reflectance values. These correction factors will be stored in memory. Each time a reading is taken, the correction factors will be used to make the ANALYZER readings compatible with the uniform, standard values.

Revising the correction factors for all 3 LEDES is not necessary each time you do this procedure. Option 83 allows you to select only the LED color that needs new correction factors. But if you select only one LED color, you must revise both the white and the black correction factors for the LED selected.

When To Do:

- When an ANALYZER has no correction factors in memory. This condition can be caused by error code D19, or when a new CPU BOARD is installed.
- When the Dr procedure does not provide correct results for one or more LED colors. Revising the Correction Factors is necessary only for the LED colors in error.
- The following chemistries are most sensitive to errors in correction factors for the given LED:
 - BUN - Red LED, black correction factor
 - CHOL - Green LED, black correction factor
 - TBIL - Green LED, white correction factor
 - CREA - Yellow LED, white and black correction factors
 - NH3 - Yellow LED, white and black correction factors

These chemistries will be the first to have errors in precision

or accuracy if the correction factors are old or are not correct. Do the Dr procedure first. If it is not within specification, do the Correction Factors procedure. If the Dr Procedure is successful, do not do the Correction Factors procedure.

- After installing the following new parts:
 - FORS ASSEMBLY
 - LOWER RACK

Special Requirements:

- This procedure is used only when version 9.0 or version 10.7 software is installed in the DT60 ANALYZER. Another procedure is available to use with version 11.0 software.
- If existing correction factors are in memory, do the Dr Procedure before doing this procedure.

Special Tools and Materials:

WHITE REFERENCE SLIDE TL-3344 with the labelled box
BLACK REFERENCE SLIDE TL-3345 with the labelled box
CALIBRATION LABEL, Publication No. XP3100-28

IMPORTANT

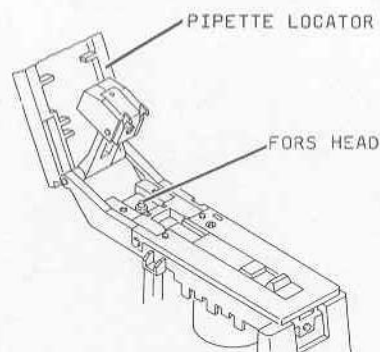
Some REFERENCE SLIDES are not fully opaque. The BAR CODE READER will not be able to detect these SLIDES when they are inserted. To make the REFERENCE SLIDES visible to the BAR CODE READER, apply white paint to a corner of each SLIDE.

Do not use WHITE REFERENCE SLIDE TL-3375 or BLACK REFERENCE SLIDE TL-3376 for this procedure. These tool slides are used only for the Kodak Ektachem DTSC MODULE.

Description:

- Prepare the equipment by cleaning the DISPOSAL CUP and FORS HEAD.
- Execute option 36 to obtain the existing correction factors and reflectance values.
- If necessary, execute option 82 to enter new reflectance values.
- Execute option 14 to enable A/D units with test results.
- Execute option 60 and select an incubation time of 39 seconds.
- Execute option 83 to take readings for the new correction factors.
- Insert REFERENCE SLIDES as necessary.
- Do the Dr Procedure.
- Calibration is necessary for any colorimetric chemistries that use an LED or LEDs with correction factors revised in this procedure. See page 8-104 for additional information.

- [1] Lift the PIPETTE LOCATOR and clean the FORS HEAD with distilled or "deionized" water and a tissue.

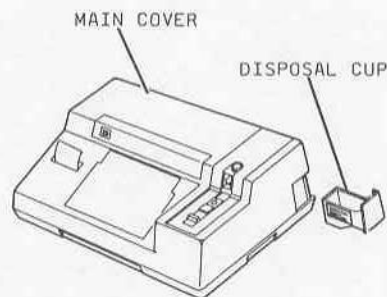


- [2] Remove and clean the DISPOSAL CUP.

- [3] Place tissue or other clean soft material in the DISPOSAL CUP to protect the REFERENCE SLIDES when they are ejected.

- [4] Install the DISPOSAL CUP.

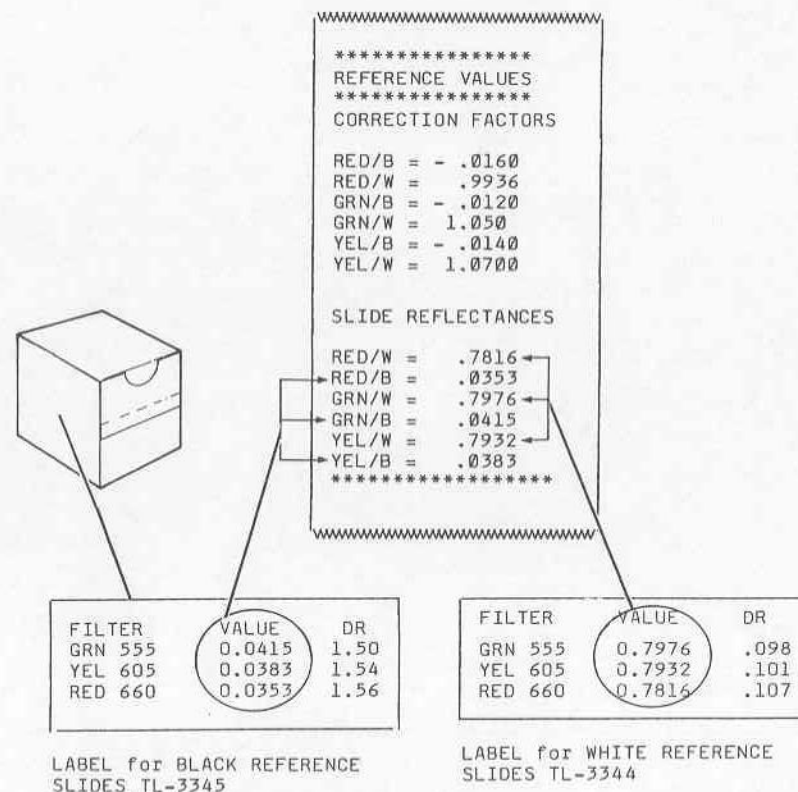
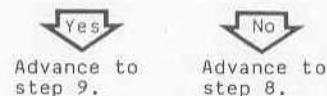
- [5] Close the PIPETTE LOCATOR and install the MAIN COVER. These parts must remain in position during this procedure, to prevent light leakage.



In steps 6 to 8, you will use option 36 to check the existing reflectance values in memory. The reflectance values in memory must be the same as the values for the REFERENCE SLIDES you will be using, given on the LABEL of the boxes. If the existing reflectance values are not correct, you will use option 82 to enter new ones.

- [6] To obtain a printout of the existing reflectance values, execute option 36.

- [7] Compare each value on the printout with the corresponding "VALUE" indicated on the LABELS of the WHITE REFERENCE SLIDES TL-3344 and the BLACK REFERENCE SLIDES TL-3345. Are the values the same?



[8] Use option 82 to enter new reflectance values:

- Enter option 82.
- The first reflectance value will be displayed.
- If the value is correct, press "enter" to advance to the following reflectance value in the list.
- If the value must be changed, press "clear" to delete the existing value, then enter the new value.
- When all reflectance values have been displayed, the message "ENTER OPTION NO." is displayed.

[9] To print A/D units with test result, execute option 14.

[10] To decrease the time for test readings, execute option 60 and select a test time of 39 seconds.

.....
· CAUTION ·
.....

Handle REFERENCE SLIDES only by the edges.

Do not clean the REFERENCE SLIDES with tissue or any other material. A scratch on the slide surface could change the reflectance characteristics. Use compressed air to remove dust from the slide web if necessary.

[11] Unpack a WHITE REFERENCE SLIDE TL-3344 and a BLACK REFERENCE SLIDE TL-3345.

In steps 12 to 19, you will use option 83 to take slide readings for the new correction factors.

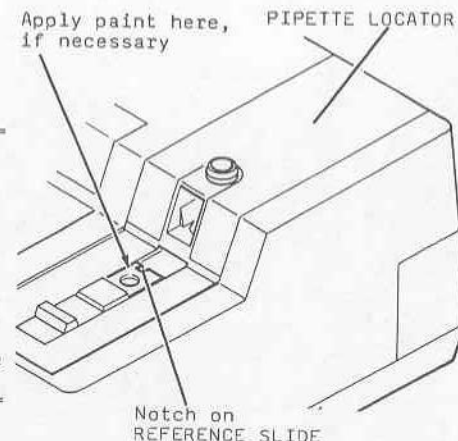
[12] Enter option 83. The first message displayed is "REFERENCE SLIDE MODE."

[13] Press "enter" to select the first LED color you want to revise.

[14] Press "chemistry select" to select the WHITE or BLACK REFERENCE SLIDE.

[15] Insert the REFERENCE SLIDE with the notch in the front left corner.

The original style of REFERENCE SLIDES is not fully opaque. The BAR CODE READER cannot detect these SLIDES when they are inserted. To make these SLIDES visible to the BAR CODE READER, apply white paint on the corner adjacent to the notch. The paint must be dry before you insert the slide again. Because the newer REFERENCE SLIDES are opaque, white paint should not be necessary.



[16] If the DT60 ANALYZER makes no response when the REFERENCE SLIDE is inserted, do the following procedure:

- Lift the PIPETTE LOCATOR.
- Remove the SLIDE.
- Apply white paint to the front left corner of the SLIDE.
- To reset the Slide Transport System, execute option 3 for 5 cycles.
- Begin the Correction Factors procedure again.

[17] Wait 39 seconds until the reading is completed. The test results will be displayed on the printout.

.....
· CAUTION ·
.....

Do not remove the DISPOSAL CUP before the reading is completed. Light leakage could cause an error in the reading.

[18] Remove the REFERENCE SLIDE from the DISPOSAL CUP.

[19] If necessary, use compressed air to clean the surface of the REFERENCE SLIDE before inserting it again.

```

~~~~~
GRN/W
RD RATIO .7801
A/D = 2941
REF = 3731
OFST = 139

GRN/B
RD RATIO .000
A/D = 137
REF = 3740
OFST = 139
~~~~~
```

 * CAUTION *

If you make an error when you insert a REFERENCE SLIDE so that it is not in the correct position, press "cal mode" to stop the procedure. You must then execute option 83 again, starting with step 12, and obtain new readings. Do not continue the procedure by selecting the same test and inserting the REFERENCE SLIDE again. If the procedure is not stopped, the software will calculate and use an average of the correct and incorrect readings. This average will cause errors in the test results.

- [20] Do steps 13 to 19 again until you have obtained printouts for all correction factors you want to revise.

Now you will calculate new correction factors and enter them into the computer memory.

- [21] Press "cal mode" to calculate new correction factors and enter them into memory.

- [22] A printout of the new correction factors is made. Write the date on the printout and keep it at the customer site.

- [23] Do the D_R Procedure.

```

*****
NEW
CORRECTION FACTORS

RED(660NM)/B  -.017
RED(660NM)/W  .8945
GRN(555NM)/B  -.012
GRN(555NM)/W  .8212
YEL(605NM)/B  -.011
YEL(605NM)/W  .8811

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```

IMPORTANT

A full wet calibration must be done for all colorimetric chemistries that use any LED or LEDs that have correction factors revised during this procedure.

- [24] Ask the customer to calibrate the DT60 ANALYZER for any colorimetric chemistries that use the LED or LEDs with revised correction factors. See the following list. Wait until the customer completes the calibration.

Green LED	Yellow LED	Red LED
AMYL	CREA	BUN/UREA
CHOL	NH ₃	URIC
GLU		HDLC
PHOS		Mg
Hb		
TBIL		
TP		
TRIG		

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.

Most customers use only one "level" of Control Fluid. When the correction factors are revised at a customer site where only one "level" of Control Fluid is used, a full wet calibration must be done for all chemistries that use the revised LEDs.

Some customers use two "levels" of Control Fluid. These customers should process tests for the affected chemistries using the two levels before doing a calibration. After checking the results, these customers have the option of not doing a full wet calibration.

Correction Factors Procedure Version 11.0 Software

Purpose:

The optical system of each DT60 ANALYZER has unique characteristics that influence the reading results. The Correction Factors procedure is used to provide uniform results from one ANALYZER to another. Correction factors are used to compare the internal black and white readings made by the ANALYZER with given values for black and white reference determined from special slides. The BLACK REFERENCE SLIDE TL-3345 and WHITE REFERENCE SLIDE TL-3344 are used to provide standard reflectances. The reflectance of these slides is measured with high precision in a laboratory, and the results are given on the LABEL of the slide box. Reflectance values for green, red, and yellow are given, corresponding to the 3 LED colors in the ANALYZER. In this procedure, you will manually enter these reflectance values into the memory of the ANALYZER. Then the ANALYZER will make readings of the tool slides, for each LED color. From this data, the computer will calculate a correction factor curve that relates the ANALYZER readings to the given reflectance values. These correction factors will be stored in memory. Each time a reading is taken, the correction factors will be used to make the ANALYZER readings compatible with the uniform, standard values.

When To Do:

- When an ANALYZER has no correction factors in memory, and a printout of the previous correction factors is not available. This condition can be caused by error code D19, or when a new CPU BOARD or MASTER BOARD is installed.
- When the DR procedure does not provide correct results for one or more LED colors.
- The following chemistries are most sensitive to errors in correction factors for the given LED:
 - BUN - Red LED, black correction factor
 - CHOL - Green LED, black correction factor
 - TBIL - Green LED, white correction factor
 - CREA - Yellow LED, white and black correction factors
 - NH3 - Yellow LED, white and black correction factors

These chemistries will be the first to have errors in precision or accuracy if the correction factors are old or are not correct. Do the DR procedure first. If it is not within specification, do the Correction Factors procedure. If the DR procedure is successful, do not do this procedure.

When To Do, continued:

- After installing the following new parts: FORS ASSEMBLY
LOWER RACK

Special Requirements:

- This procedure is used only when version 11.0 software is installed in the DT60 ANALYZER. Another procedure is available to use with version 9.0 or version 10.7 software.
- If existing correction factors are in memory, do the DR Procedure before doing this procedure.

Special Tools and Materials:

WHITE REFERENCE SLIDE TL-3344 with the labelled box
BLACK REFERENCE SLIDE TL-3345 with the labelled box
CALIBRATION LABEL, Publication No. XP3100-28

IMPORTANT

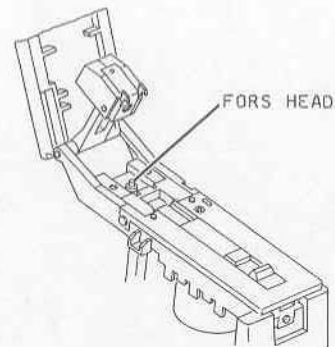
Some REFERENCE SLIDES are not fully opaque. The BAR CODE READER will not be able to detect these SLIDES when they are inserted. To make the REFERENCE SLIDES visible to the BAR CODE READER, apply white paint to a corner of each slide.

Do not use WHITE REFERENCE SLIDE TL-3375 or BLACK REFERENCE SLIDE TL-3376 to do this procedure. These tool slides are used only for the Kodak Ektachem DTSC MODULE.

Description:

- Prepare the equipment by cleaning the DISPOSAL CUP and the FORS HEAD.
- Execute option 29 and select: "LONG FORM" - "YES"
"DR CHECK" - "NO"
"# REPS" - 2
- Compare the existing reflectance values on the printout with the values on the boxes. Enter new values if necessary.
- Insert the REFERENCE SLIDES and manually identify each.
- Press "cal mode" to calculate the new correction factors.
- Enter new correction factors only as necessary. To keep an existing value, press "chemistry select" to display "NO", then press "enter".
- Execute option 36 and compare the printout with the option 29 printout to check that the new correction factors were entered into the memory.
- Do the DR Procedure.
- Calibration is necessary for any colorimetric chemistries that use an LED or LEDs with correction factors revised in this procedure. See page 8-116 for additional information.

- [1] Lift the PIPETTE LOCATOR and clean the FORS HEAD with distilled or "deionized" water and a tissue.

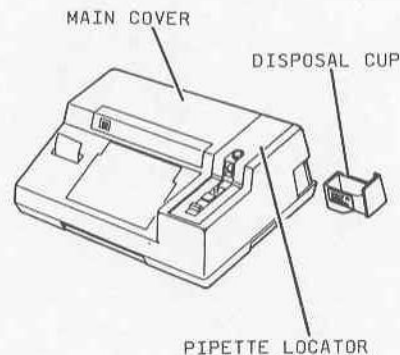


- [2] Remove and clean the DISPOSAL CUP.

- [3] Place tissue or other clean soft material in the DISPOSAL CUP to protect the REFERENCE SLIDES when they are ejected.

- [4] Install the DISPOSAL CUP.

- [5] Close the PIPETTE LOCATOR COVER and install the MAIN COVER. These parts must remain in position during this procedure, to prevent light leakage.



- [6] Execute option 3 for 5 cycles to align the FORS WEIGHT in the center.

IMPORTANT

To avoid changing the alignment of the FORS WEIGHT, do not lift the PIPETTE LOCATOR after this step.

In steps 7 to 13 you will enter option 29 and select the parameters for the procedure.

- [7] Execute Option 29.

The first message displayed is "SELECT LONG FORM", with the "YES" response.

- [8] Press:
- "chemistry select", to display the "NO" response
- "enter".

The message, "SELECT DR CHECK" with the "NO" response, is displayed.

- [9] Press "enter".

The message, "ENTER #REPS (1-10)" with the "1" response, is displayed.

- [10] Press "clear".

- [11] To select 2 readings, press "2". The DT60 ANALYZER will make 2 readings of each slide that is inserted.

- [12] Press "enter".

The message "PRINTING CORRECTION FACTORS" is displayed.

A printout is made of the existing correction factors and slide reflectances stored in the memory.

The message, "CHECK REFERENCE VALUES"/"CHOOSE VALUE (SELECT TO END)", is displayed.

The values on the LABELS of the REFERENCE SLIDES have been measured with high precision in manufacturing. When these reference values are entered into the memory of the DT60 ANALYZER, the software will be able to compare these values with the actual readings from the REFERENCE SLIDES. The correction factors can then be calculated, to compare the readings of the DT60 ANALYZER to the reference values. In steps 13 and 14 you will check the values in the memory and, if necessary, change them.

[19] Press "enter".

The message "WRDT"/"WAIT UNTIL SLIDE PROCESSED" is displayed.

Option 29 now moves the REFERENCE SLIDE to the Read Station and takes 2 reference and offset readings. The RACKS will move to place the WHITE REFERENCE in the Read Station.

[20] Wait approximately 4 minutes until the readings are completed.

A printout of the readings is made. This printout is not used in this procedure.

The message "INSERT STANDARDS SLIDE" is displayed.

[21] Insert the BLACK REFERENCE SLIDE TL-3345.

[22] If the ANALYZER makes no response when the REFERENCE SLIDE is inserted, do the following procedure:

- Lift the PIPETTE LOCATOR.
- Remove the SLIDE.
- Apply white paint to the front left corner of the SLIDE.
- Press "cal mode" to cancel option 29.
- To reset the Slide Transport System, execute option 3 for 5 cycles.
- Begin the Correction Factors procedure again.

[23] Press "chemistry select" to display the response "BRDT".

[24] Press "enter".

The message "BRDT"/"WAIT UNTIL SLIDE PROCESSED" is displayed.

[25] Wait approximately 4 minutes until the readings are completed.

A printout of the readings is made. This printout is not used in this procedure.

The message "INSERT STANDARDS SLIDE" is displayed.

[26] Do not insert a REFERENCE SLIDE again.

Correction Factors - Version 11.0 Software
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[27] To calculate and display the new correction factors, press "cal mode".

The message "CALCULATING CORRECTION" is displayed.

A printout of the new correction factors for the red LED is made.

The message "UPDATE CORRECTION FACTORS?" with the "YES" response is displayed.

Enter new correction factors only for LEDs that did not provide successful results in the Dr Procedure, or for LEDs that do not have existing correction factors.

```
*****  
NEW  
CORRECTION FACTORS  
RED(660NM)/B -.016  
RED(660NM)/W .8616  
*****
```

[28] If the Dr procedure for the Red LED was not successful, or if there are no existing correction factors for the Red LED, press "enter" to enter the new correction factors into memory.

If the Red LED does not need new correction factors, press "chemistry select" to display "NO", and then press "enter".

The messages and printouts will occur again for the Green and Yellow LEDs.

[29] If necessary, enter new correction factors for the Green and Yellow LEDs, using the procedure in step 28.

Option 29 is completed. The message "ENTER OPTION NO." is displayed.

[30] Lift the PIPETTE LOCATOR.

[31] Remove the REFERENCE SLIDE from the Read Station

An intermittent error in option 29 can occasionally cause the new correction factors not to be entered into memory. In the last steps, you will use option 36 to check that the new correction factors are in memory.

[32] Execute option 36 to obtain a printout of the correction factors.

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- [33] Compare the option 36 printout with the option 29 printout.
Are the values the same on both printouts for any revised LEDS?



Advance to
step 35.



Advance to
step 34.

- [34] Execute option 81 to manually enter the new correction factors from the option 29 printout into the computer memory.
- To use option 81: Press "enter" to keep the contents displayed and to advance to the next value.
- Press "clear" to delete the value displayed, and then enter the new correction factor from the option 29 printout.

- [35] Write the dates on the Option 36 printout. Keep the printout at the customer site.

- [36] Do the Dr Procedure.

IMPORTANT

A full wet calibration must be done for all colorimetric chemistries that use any LED or LEDS that have correction factors revised during this procedure.

- [37] Ask the customer to calibrate the DT60 ANALYZER for any colorimetric chemistries that use the LED or LEDS with revised correction factors. See the following list.
Wait until the customer completes the calibration.

Green LED

AMYL
CHOL
GLU
PHOS
Hb
TBIL
TP
TRIG

Yellow LED

CREA
NH₃

Red LED

BUN/UREA
URIC
HDL C
Mg

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.

Most customers use only one "level" of Control Fluid. When the correction factors are revised at a customer site where only one "level" of Control Fluid is used, a full wet calibration must be done for all chemistries that use the revised LEDS.

Some customers use two "levels" of Control Fluid. These customers should process tests for the affected chemistries using the two levels before doing a calibration. After checking the results, these customers have the option of not doing a full wet calibration.

DR Procedure

Versions 9.0 and 10.7 Software

Purpose:

DR, or "Density of Reflectance", is a measurement of light reflectance through an optical system. This test will check the ability of the FORS ASSEMBLY to correctly read REFERENCE SLIDES with a given DR value. The BLACK REFERENCE SLIDE TL-3345 and WHITE REFERENCE SLIDE TL-3344 are used to provide standard DR values. The DR of these slides is measured with high precision in a laboratory, and the results are given on the LABEL of the box of slides. DR values for green, red, and yellow are given, corresponding to the 3 LED colors in the ANALYZER. By comparing the ANALYZER readings with the given values, you can determine if the reading system in the ANALYZER is operating within normal parameters.

This test is similar to the Correction Factors procedure, but the DR values are not stored in the computer memory. Correction factors are retrieved from memory and applied to all readings, including the readings in this DR test. DR values check the operation of the reading system at the time they are executed.

Specifications:

For white readings, the DR result must be within ± 0.025 of the value on the LABEL of the WHITE REFERENCE SLIDE TL-3344.

For black readings, the DR result must be within ± 0.05 of the value on the LABEL of the BLACK REFERENCE SLIDE TL-3345.

When To Do:

- When a DT60 ANALYZER will not calibrate successfully.
- After the Correction Factors procedure
- After adjusting the FORS ASSEMBLY.
- After adjusting the LOWER RACK/HOME SENSOR
- After installing a new HOME SENSOR
- After installing a new MECHANICAL MODULE
- After installing new HEATER RODS or THERMISTOR
- After installing a new MOTOR AND PINION ASSEMBLY

When To Do (continued):

- To help diagnose precision and accuracy errors in test results. The following chemistries are most sensitive to errors in correction factors for the given LED:
 - BUN - Red LED, black correction factor
 - CHOL - Green LED, black correction factor
 - TBIL - Green LED, white correction factor
 - CREA - Yellow LED, white and black correction factors
 - NH3 - Yellow LED, white and black correction factors

The chemistries in the list will be the first to have error in precision or accuracy if the correction factors are old or not correct. Do the DR procedure first, and if it is not within specification, do the Correction Factors procedure.

Special Requirements:

This procedure is used only when V9.0 or V10.7 software is installed in the ANALYZER. Another procedure is available to use with V11.0 software.

Special Tools:

WHITE REFERENCE SLIDE TL-3344 and the labelled box
BLACK REFERENCE SLIDE TL-3345 and the labelled box

NOTE

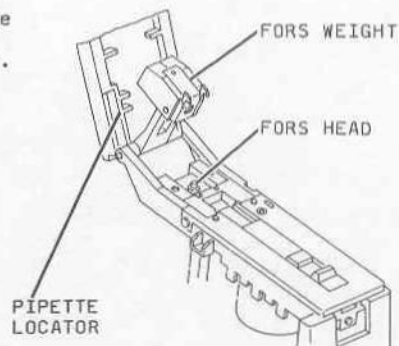
Some REFERENCE SLIDES are not fully opaque. The BAR CODE READER will not be able to detect these SLIDES when they are inserted. Applying white paint to the corner of these REFERENCE SLIDES makes them visible to the BAR CODE READER.

Do not use WHITE REFERENCE SLIDE TL-3375 or BLACK REFERENCE SLIDE TL-3376 to do this procedure. Those slides are used only for the Kodak Ektachem DTSC MODULE.

Description:

- Clean the DISPOSAL CUP and FORS HEAD to prepare the equipment.
- Execute option 14 to enable A/D units with test results.
- Execute option 3 for 5 cycles to align the FORS WEIGHT over the FORS HEAD.
- Execute option 60 and select an incubation time of 39 seconds.
- Execute option 94 to use the existing correction factors.
- Execute option 83 to make readings.
- Insert REFERENCE SLIDES as necessary.
- Compare the results on the printout with the values on the LABELS of the boxes of REFERENCE SLIDES.
- Deenergize and then energize the ANALYZER to delete the options.

- [1] Lift the PIPETTE LOCATOR and the FORS WEIGHT and clean the FORS HEAD with distilled or deionized water and a tissue.

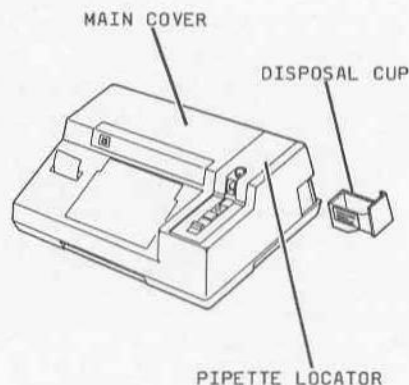


- [2] Remove and clean the DISPOSAL CUP.

- [3] Place tissue or other clean soft material in the DISPOSAL CUP to protect the REFERENCE SLIDES when they are ejected.

- [4] Install the DISPOSAL CUP.

- [5] Close the PIPETTE LOCATOR and the MAIN COVER. These parts must remain closed during this procedure, to prevent light leakage.



- [6] To obtain the A/D units on the printout with the test results, execute option 14.
- [7] To align the center of the FORS WEIGHT above the FORS HEAD, execute option 3 for 5 cycles. Do not lift the PIPETTE LOCATOR or the FORS WEIGHT after this step.
- [8] To decrease the time for test readings, execute option 60 and select a test time of 39 seconds.

Option 94 is used to enable the D_R procedure mode during option 83. Option 94 prevents option 83 from calculating new correction factors. The existing correction factors are used to calculate the D_R value.

- [9] To prevent new correction factors from being stored in memory, execute option 94 .

.....
 • CAUTION •

Handle the REFERENCE SLIDES only by the edges.

Do not clean the REFERENCE SLIDES with tissue or any other material. A scratch on the slide surface could change the reflectance characteristics. Use compressed air to remove dust from the slide web if necessary.

- [10] Unpack a WHITE REFERENCE SLIDE TL-3344 and a BLACK REFERENCE SLIDE TL-3345.

In steps 11 to 19 you will use option 83 to take readings for the test.

- [11] Enter option 83. The first message displayed is "REFERENCE SLIDE MODE."
- [12] Press "enter" to select the first LED color you want to revise.
- [13] Press "chemistry select" to select the WHITE or BLACK REFERENCE SLIDE.

- [14] Insert the REFERENCE SLIDE with the notch in the front left corner.

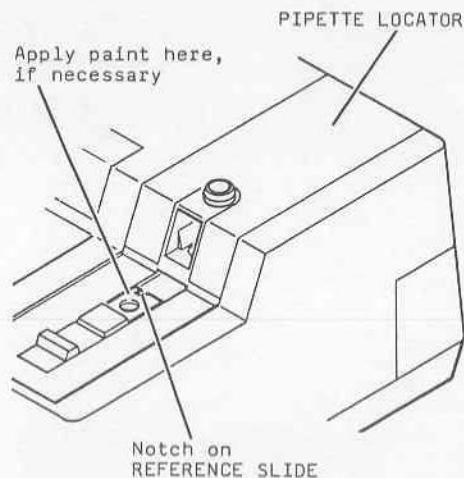
The original style of REFERENCE SLIDES is not fully opaque. The BAR CODE READER cannot detect these SLIDES when they are inserted. To make these SLIDES visible to the BAR CODE READER, apply white paint on the corner adjacent to the notch. Do not insert the SLIDES again until the paint is dry. Because the newer REFERENCE SLIDES are opaque, whitepaint is not necessary.

- [15] If the DT60 ANALYZER makes no response when the REFERENCE SLIDE is inserted, do the following procedure:

- Lift the PIPETTE LOCATOR.
- Remove the SLIDE.
- Apply white paint to the front left corner of the SLIDE.
- Press "cal mode" to cancel options 83 and 94.
- To reset the Slide Transport System, execute option 3 for 5 cycles.
- Begin the DR procedure again.

.....
• CAUTION •
.....

Do not remove the DISPOSAL CUP before the reading is completed. Light leakage could cause an error in the reading.



- [16] Wait 39 seconds until the reading is completed. The test results will be displayed on the printout.

.....
• CAUTION •
.....

If an error message, "RESULTS ABOVE ANALYZER RANGE" or "RESULTS BELOW ANALYZER RANGE", is on the printout with the test results, do not use the test results. A malfunction has prevented the DR procedure from completing successfully. Use the diagnostics to repair the malfunction.

- [17] Remove the REFERENCE SLIDE from the DISPOSAL CUP.

- [18] If necessary, use compressed air to clean the surface of the REFERENCE SLIDE before inserting it again.

.....
• CAUTION •
.....

If you make an error when you insert a REFERENCE SLIDE so that it is not in the correct position, press "cal mode" to stop the procedure. You must then execute options 94 and 83 again to obtain new readings. Do not continue the procedure by selecting the same test and inserting the REFERENCE SLIDE again. If the procedure is not stopped, the software will calculate and use an average of the correct and the incorrect readings. This average will cause errors in the test results.

- [19] Do steps 9 to 18 again until you have obtained printouts for all LEDS you want to check.

GRN/W
.0942 DR
RD RATIO .7801
A/D = 2941
REF = 3731
OFST = 139

GRN/B
1.510 DR
RD RATIO .000
A/D = 137
REF = 3740
OFST = 139

YEL/W
.1094 DR
RD RATIO .7625
A/D = 2911
REF = 3769
OFST = 140

YEL/B
1.548 DR
RD RATIO .003
A/D = 132
REF = 3778
OFST = 144

RED/W
.1120 DR
RD RATIO .7751
A/D = 2964
REF = 3759
OFST = 145

RED/B
1.552 DR
RD RATIO .001
A/D = 138
REF = 3761
OFST = 145

[20] Press "cal mode" to cancel options 94 and 83.

[21] Compare each of the "DR" values on the printout for white readings with the corresponding "DR" value on the LABEL of the WHITE REFERENCE SLIDES TL-3344.

Is each of the printout values within ± 0.025 of the value on the LABEL?



Advance to step 22.

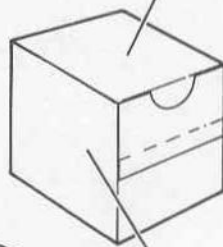


Advance to step 26.

DT60 WHITE REFERENCE SLIDE LABEL

GRN/W
.0942 DR
RD RATIO .7801
A/D = 2941
REF = 3750
OFST = 139

GRN/B
1.510 DR
RD RATIO .000
A/D = 137
REF = 3740
OFST = 139



FILTER	VALUE	DR
GRN 555	0.8146	.098
YEL 605	0.8093	.101
RED 660	0.7985	.107

[22] Compare each of the "DR" values on the printout for black readings with the corresponding "DR" value on the LABEL for the BLACK REFERENCE SLIDES TL-3345.

Is each of these 3 values within ± 0.05 of the value on the LABEL?



Advance to step 23.



Advance to step 26.

[23] Lift the PIPETTE LOCATOR.

[24] Remove the BLACK REFERENCE SLIDE from the Read Station.

[25] Deenergize and then energize the ANALYZER to reset all options and to enable the customer test mode. This procedure is completed.

[26] If the DR values for any LED are not within the specifications, do the following procedures:

- Use options 94 and 83 and do the DR test again. The results might be correct.
- If the DR test is not successful when you do it again, do the Correction Factors procedure, only for the LED with the results that are not correct.
- After revising the correction factors, use options 94 and 83 to check the DR again for the LED that provided the results that were not within the specifications.
- If the DR is not within specifications now, advance to step 27.

[27] Check for the following hardware malfunctions:

- The WHITE REFERENCE might be dirty or might not be attached to the bottom surface of the LOWER RACK.
- The motion of the UPPER RACK and LOWER RACK might not be correct. Check the adjustments for the Slide Transport System.
- The movement of the FORS WEIGHT might have a bind.
- The FORS HEAD might be dirty or broken.
- The REFERENCE SLIDES might be dirty or have scratches.
- Light leakage through the MAIN COVER, PIPETTE LOCATOR, DISPOSAL BOX might cause the results to be outside the specifications.

D_R Procedure

Version 11.0 Software

Purpose:

D_R , or "Density of Reflectance", is a measurement of light reflectance through an optical system. This test will check the ability of the FORS ASSEMBLY to correctly read REFERENCE SLIDES with a given D_R value. The BLACK REFERENCE SLIDE TL-3345 and WHITE REFERENCE SLIDE TL-3344 are used to provide standard D_R values. The D_R of these slides is measured with high precision in a laboratory, and the results are given on the LABEL of the slides. D_R values for green, red, and yellow are given, corresponding to the 3 LED colors in the ANALYZER. By comparing the ANALYZER readings with the given values, you can determine if the reading system in the ANALYZER is operating within normal parameters.

This test is similar to the Correction Factors procedure, but the D_R values are not stored in memory. Correction factors are retrieved from memory and applied to all readings, including the readings in this D_R test. D_R values check the operation of the reading system at the time they are executed.

Specifications:

For white readings, the D_R result must be within ± 0.025 of the value on the LABEL of the WHITE REFERENCE SLIDE TL-3344.

For black readings, the D_R result must be within ± 0.05 of the value on the LABEL of the BLACK REFERENCE SLIDE TL-3345.

When To Do:

- After the Correction Factors procedure
- To help diagnose precision and accuracy errors in test results. The following chemistries are most sensitive to errors in correction factors for the given LED:

BUN - Red LED, black correction factor
CHOL - Green LED, black correction factor
TBIL - Green LED, white correction factor
CREA - Yellow LED, white and black correction factors
NH3 - Yellow LED, white and black correction factors

These chemistries will be the first to have error in precision or accuracy if the correction factors are incorrect or old. Do the D_R procedure first, and if it is not within specification, do the Correction Factors procedure.

When to Do (continued)

- After adjusting the FORS ASSEMBLY.
- After adjusting the LOWER RACK/HOME SENSOR
- After installing a new HOME SENSOR
- After installing a new MECHANICAL MODULE
- After installing new HEATER RODS or THERMISTOR
- After installing a new MOTOR AND PINION ASSEMBLY

Special Requirements:

This procedure is used only when version 11.0 software is installed in the DT60 ANALYZER. Another procedure is available to use with versions 9.0 and 10.7 software.

Special Tools:

WHITE REFERENCE SLIDE TL-3344 with the labelled box
BLACK REFERENCE SLIDE TL-3345 with the labelled box

IMPORTANT

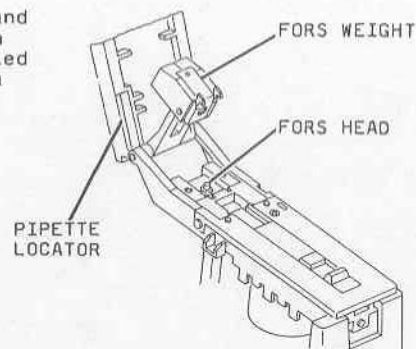
Some REFERENCE SLIDES are not fully opaque. The BAR CODE READER will not be able to detect these SLIDES when they are inserted. To make the REFERENCE SLIDES visible to the BAR CODE READER, apply white paint to a corner of each slide.

Do not use WHITE REFERENCE SLIDE TL-3375 or BLACK REFERENCE SLIDE TL-3376 to do this procedure. Those slides are used only for the Kodak Ektachem DTSC MODULE.

Description:

- Prepare the equipment by cleaning the DISPOSAL CUP and FORS HEAD.
- Execute option 29 and select:
 - "LONG FORM" - "YES"
 - "DR CHECK" - "YES"
 - "# REPS" - 3
- Insert REFERENCE SLIDES as necessary.
- Compare the results on the printout with the values on the LABEL.

- [1] Lift the PIPETTE LOCATOR and the FORS WEIGHT, and clean the FORS HEAD with distilled or "deionized" water and a tissue.

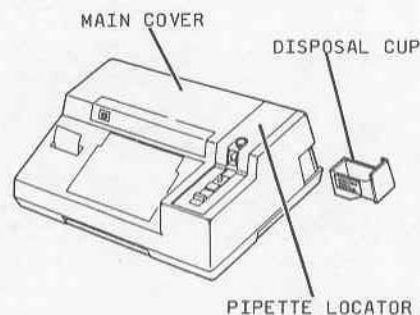


- [2] Remove and clean the DISPOSAL CUP.

- [3] Place tissue or other clean soft material in the DISPOSAL CUP to protect the REFERENCE SLIDES when they are ejected.

- [4] Install the DISPOSAL CUP.

- [5] Close the PIPETTE LOCATOR and the MAIN COVER. These parts must remain closed during this procedure, to prevent light leakage.



- [6] To align the center of the FORS WEIGHT above the FORS HEAD, execute option 3 for 5 cycles. Do not lift the PIPETTE LOCATOR or the FORS WEIGHT after this step.

In steps 7 to 13 you will enter Option 29 and select the parameters for the procedure.

- [7] Enter Option 29.

The first message displayed is "SELECT LONG FORM", with a "YES" response.

- [8] Press "enter".

The following message displayed is "SELECT DR CHECK", with a "NO" response.

- [9] Press "chemistry select" to display the "YES" response.

- [10] Press "enter".

The message "ENTER #REPS (1-10)" is displayed, with a "1" response".

- [11] Press "clear".

- [12] To select 3 readings, press "3".

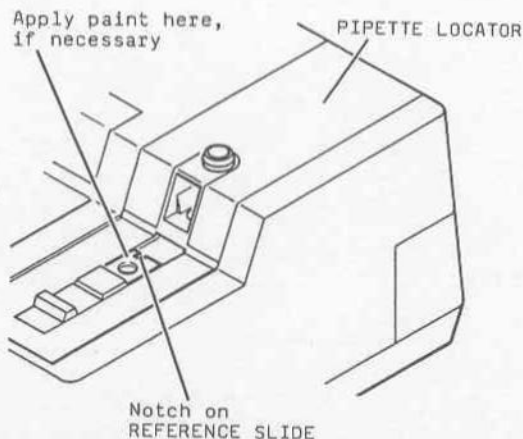
- [13] Press "enter".

The message "INSERT STANDARDS SLIDE" is displayed.

.....
• CAUTION •
.....

Touch only the edges of the
REFERENCE SLIDES. Do not
touch the web.

- [14] Insert the WHITE REFERENCE
SLIDE TL-3344 with the notch
in the front left corner.



The original style of REFERENCE SLIDES is not fully opaque. The BAR CODE READER cannot detect these SLIDES when they are inserted. To make these SLIDES visible to the BAR CODE READER, apply white paint on the corner adjacent to the notch. Do not insert the SLIDES again until the paint is dry. Because the newer REFERENCE SLIDES are opaque, white paint is not necessary.

- [15] If the DT60 ANALYZER makes no response when the REFERENCE SLIDE is inserted, do the following procedure:

- Lift the PIPETTE LOCATOR.
- Remove the SLIDE.
- Apply white paint to the front left corner of the SLIDE.
- Press "cal mode" to cancel option 29.
- To reset the Slide Transport System, execute option 3 for 5 cycles.
- Begin the D_R procedure again.

The message "SLIDE NOT IDENTIFIED"/"SELECT TEST" is displayed. Because the REFERENCE SLIDES do not have BAR CODES, the system cannot identify them. In steps 16 and 17 you will manually identify the SLIDE.

- [16] Press "chemistry select" to display "WRDT".

- [17] Press "enter".

The message "WRDT"/"WAIT UNTIL SLIDE PROCESSED" is displayed. Option 29 now moves the REFERENCE SLIDE to the Read Station and takes 3 readings. The RACKS will move to place the WHITE REFERENCE in the Read Station.

- [18] Wait approximately 6 minutes until the readings are completed.

A printout of the readings is made.

- [19] Keep the printout to use in step 28.

The message "INSERT STANDARDS SLIDE" is displayed.

- [20] Insert the BLACK REFERENCE SLIDE TL-3345.

- [21] If there is no response when the REFERENCE SLIDE is inserted, do the following procedure:

- Lift the PIPETTE LOCATOR.
- Remove the SLIDE.
- Apply white paint to the front left corner of the SLIDE.
- Press "cal mode" to cancel option 29.
- To reset the Slide Transport System, execute option 3 for 5 cycles.
- Begin the D_R procedure again.

- [22] Press "chemistry select" to display "BRDT".

- [23] Press "enter".

The message "BRDT"/"WAIT UNTIL SLIDE PROCESSED" is displayed.

- [24] Wait approximately 6 minutes for the readings to be completed.

A printout of the readings is made.

- [25] Keep the printout to use in step 28.

The message "INSERT STANDARDS SLIDE" is displayed.

[26] Do not insert a REFERENCE SLIDE again.

[27] Press "chemistry select" to cancel Option 29.

[28] Compare each of the 3 "MEAN" D_R values on the printout for white readings with the corresponding "DR" value on the LABEL of the WHITE REFERENCE SLIDES TL-3344.

Is each of these 3 values within ± 0.025 of the value on the LABEL?

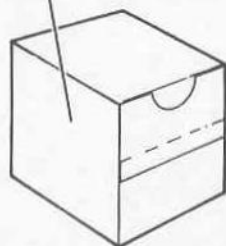


Advance to step 29.



Advance to step 32.

FILTER	VALUE	DR
GRN 555	0.8146	.098
YEL 605	0.8093	.101
RED 660	0.7985	.107



```

*****
RED(660NM)/W
RD RATIO .7947
.0983 DR
G(DR) = 0
A/D = 3052
REF = 3860
OFST = 11

RD RATIO .7945
.0994 DR
G(DR) = 0
A/D = 3052
REF = 3871
OFST = 9

RD RATIO .7945
.0995 DR
G(DR) = 0
A/D = 3052
REF = 3871
OFST = 10

-----MEAN-----
.0990
-----STD. DEV.-----
.0006944
*****
GRN(555NM)/W

```

```

-----MEAN-----
.0990
-----STD. DEV.-----
.0006944
*****
YEL(605NM)/W

-----MEAN-----
.0990
-----STD. DEV.-----
.0006944
*****

```

[29] Compare each of the 3 "MEAN" D_R values on the printout for black readings with the corresponding "DR" value on the LABEL of the BLACK REFERENCE SLIDES TL-3345.

Is each of these 3 values within ± 0.05 of the value on the LABEL?



Advance to step 30.



Advance to step 32.

Option 29 is completed. The message "ENTER OPTION NO." is displayed.

[30] Lift the PIPETTE LOCATOR.

[31] Remove the BLACK REFERENCE SLIDE from the Read Station. This procedure is completed.

[32] If the D_R values for any LED are not within specification, do the following procedures:

- Use options 29 and do the D_R test again. The results might be correct.
- If the D_R test is not successful when you do it again, do the Correction Factors procedure, only for the LED with the results that are not correct.
- After revising correction factors, use option 29 to check the D_R again for the LED that provided the results that were not within the specifications.
- If the D_R is not within specifications now, advance to step 33.

[33] Check for the following hardware malfunctions:

- The WHITE REFERENCE might be dirty or might not be attached to the bottom surface of the LOWER RACK.
- The motion of the UPPER RACK and LOWER RACK might not be correct. Check the adjustments for the Slide Transport System.
- The FORS WEIGHT motion might have a bind.
- The FORS HEAD might be dirty or broken.
- The REFERENCE SLIDES might be dirty or have scratches.
- Light leakage through the MAIN COVER, PIPETTE LOCATOR, DISPOSAL BOX might cause the results to outside the specifications.

Checkout Procedure for the FORS WEIGHT HEATER

Purpose:

To check that the FORS WEIGHT HEATER operates and is heated to the correct temperature. The HEATER prevents condensation in the Read Station. If condensation occurs when a slide is in the Read Station, ammonia as a gas from the patient sample can be dissolved in the condensation drops on the surfaces above the slide. Then condensation drops containing dissolved ammonia could fall into the patient samples on following slides and might affect the test results.

Specifications:

- The temperature of the front of the FORS WEIGHT ASSEMBLY should be approximately 41° to 48° C (107° to 118° F).
- The resistance measured at CONNECTOR P35 should be approximately 36.0 to 37.0 ohms.
- The voltage measured at the following locations should be +4.6 to +5.4 V dc:

CONNECTOR P35
C3 on the CDM/CLM BOARD

MULTIMETER TL-3424	
+	-
red	black

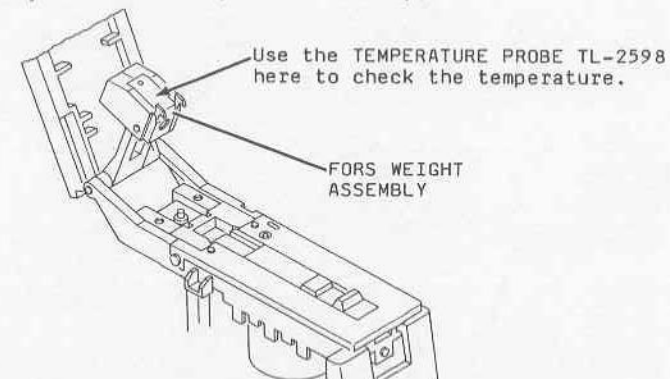
When to Do:

- If CREA slides do not provide accurate or precise results. CREA slides are most sensitive to ammonia contamination.
- When diagnosing error code R18.

Special Tools:

TEMPERATURE PROBE TL-2598
MULTIMETER TL-3424

- [1] Allow the DT60 ANALYZER to be energized for approximately 30 minutes.
- [2] Use the TEMPERATURE PROBE TL-2598 and check that the temperature on the front surface of the FORS WEIGHT ASSEMBLY is approximately 41° to 48° C (107° to 118° F).



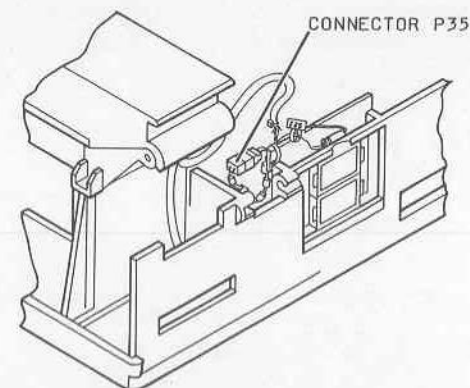
- [3] Use the MULTIMETER TL-3424 and measure the resistance across the 2 PINS on the disconnected CONNECTOR P35.
- [4] Is the resistance approximately 36.0 to 37.0 ohms?



Advance to
step 6.



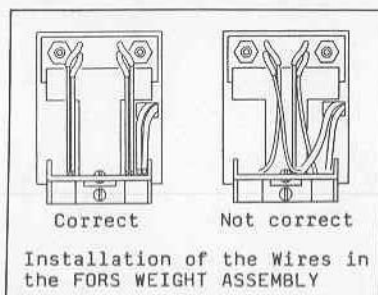
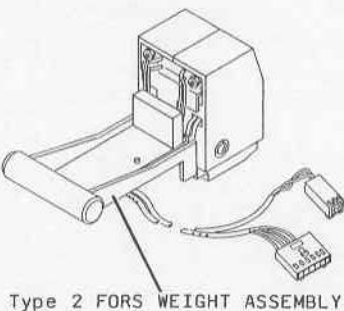
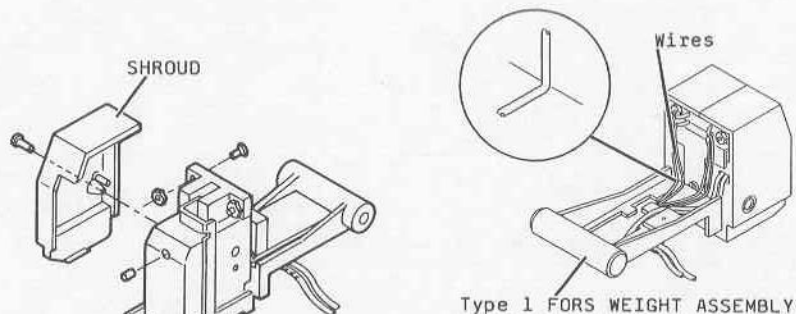
Advance to
step 5.



- [5] Install a replacement for the FORS WEIGHT ASSEMBLY. See the Parts and Removals section for the DT60 ANALYZER.

IMPORTANT

To prevent binds in the PAWLS, check that the FORS WEIGHT SHROUDS and the wires are installed correctly when you install the FORS WEIGHT ASSEMBLY. See the Parts and Removals section for the DT60 ANALYZER.



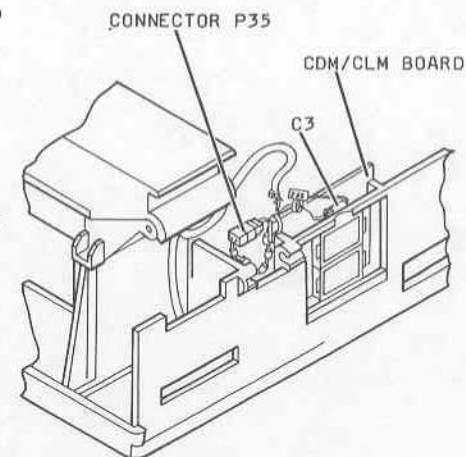
- [6] Check that the CDM/CLM BOARD is seated correctly.

- [7] Check CONNECTOR P35 for damage, and repair it as necessary.

- [8] Use the MULTIMETER TL-3424 and check the +5 V signal at the following locations:

- CONNECTOR P35
- C3 on the CDM/CLM BOARD

MULTIMETER TL-3424	
+	-
red	black



- [9] Is the voltage +4.6 to +5.4 V dc?

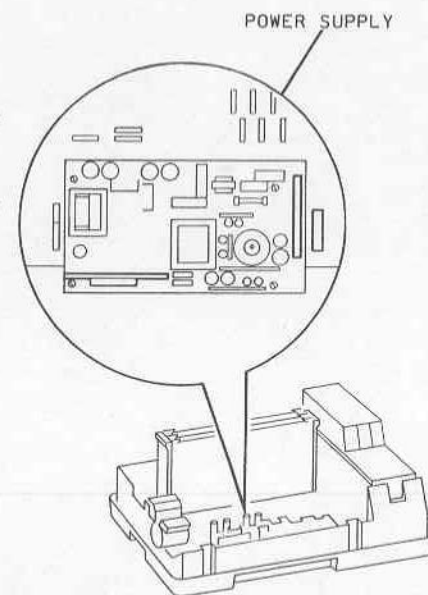


This procedure is completed.



Advance to step 10.

- [10] Check the +5 V signal between the POWER SUPPLY and the CDM/CLM BOARD. See the checkout procedure for the POWER SUPPLY.



NON-VOLATILE RAM - Obtaining / Clearing / Entering Data

Purpose:

The NON-VOLATILE RAM in the DT60 ANALYZER is used to store all data that can be revised and that should not be erased when the power is removed from the DT60 ANALYZER. Examples of these data are:

- correction factors
- calibration parameters
- reflectance values
- reporting modes for measurement units and BUN/UREA
- calibrated generation numbers
- post-prediction adjustment values

NOTE

Post-prediction adjustment values are used by some customers to provide results that are similar to the equipment of other manufacturers.

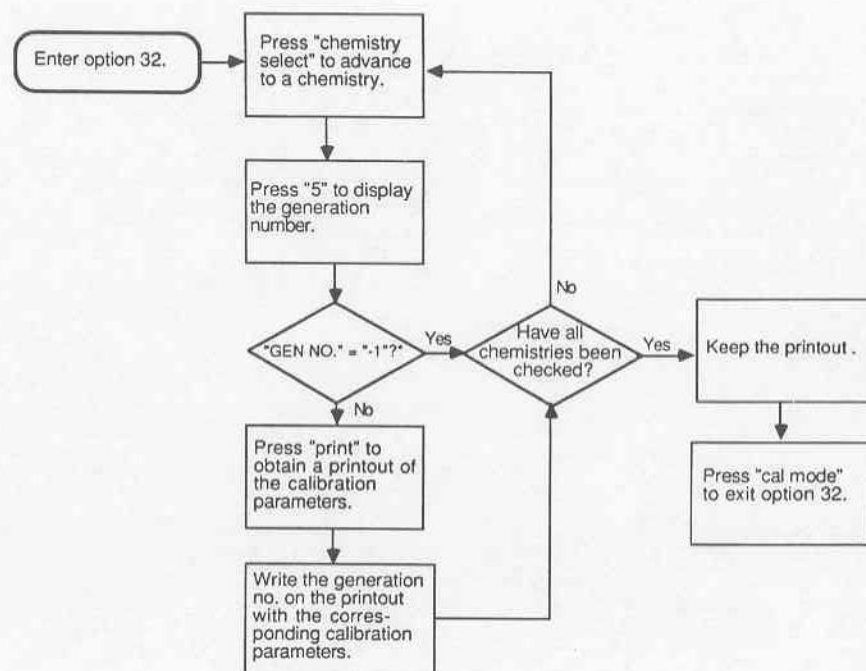
When the NON-VOLATILE RAM for the DT60 ANALYZER is new, or when the memory in the NON-VOLATILE RAM has been cleared by the computer, the necessary data for processing tests must be entered manually through the KEYBOARD. This procedure can be used to:

- obtain printouts before you do a procedure that removes or clears the memory in the NON-VOLATILE RAM,
- clear the memory in the NON-VOLATILE RAM, and
- enter existing data from available printouts, either stored in the customer copy of the Test Methodologies publication for the Kodak Ektachem DT SYSTEM, or as the result of executing options to obtain the data at the beginning of a service call.

Obtaining Data before the NON-VOLATILE RAM is Cleared

- [1] For the colorimetric chemistries, execute Option 36 to obtain a printout of the correction factors and the reflectance values now stored in the NON-VOLATILE RAM in the DT60 ANALYZER.
- [2] For the rate chemistries, execute Option 50 to obtain a printout of the correction factors and the reflectance values now stored in the NON-VOLATILE RAM in the DTSC MODULE.

- [3] Do the following procedure to obtain the calibration parameters for all calibrated chemistries:



* A generation number of "-1" indicates that no calibration parameters exist for the chemistries selected.

- [4] Write the date on the printouts. Keep the printouts to use when the data must be entered into the NON-VOLATILE RAM again, or store them in the customer copy of the Test Methodologies publication for the Kodak Ektachem DT SYSTEM.

Clearing the NON-VOLATILE RAM

- [1] Execute Option 73.
- [2] Enter the number "1" to initialize the memory and to reset the checksum.
- [3] Move the MAIN POWER SWITCH down to the "0" position.
- [4] Wait 5 seconds.
- [5] Move the MAIN POWER SWITCH up to the "1" position.
- [6] Check the printout for the message "D19 - MEMORY RESET". This message indicates that the NON-VOLATILE RAM is cleared.

Entering Data after the NON-VOLATILE RAM is Cleared

NOTE

If the customer has printouts of the existing values for the correction factors, do step 1. If the memory was cleared before printouts could be obtained, you must do the Correction Factors procedure.

- [1] To enter existing values for correction factors, do the following procedure:
 - Execute Option 81.
 - Press "clear" to delete the existing value for the first LED displayed in the LC DISPLAY.
 - Obtain the existing value for that LED from the stored printout, and enter that value.

IMPORTANT

Check that the "-" symbols and the decimal points are entered correctly.

- Repeat this procedure until all 6 correction factors have been entered.

NOTE

If the customer has printouts of the existing values for the calibration parameters, do step 2. If no printouts are available, and the NON-VOLATILE RAM was cleared before new printouts could be obtained, a full wet calibration must be done for each chemistry used by the customer.

- [2] To enter the existing calibration parameters and the corresponding generation numbers, do the following procedure:

- Execute Option 32.
- Press "chemistry select" to advance to the first chemistry in the software list.
- If the calibration parameters and generation number for that chemistry are on the printout, press "1" to display the existing value for the "Level 1".

NOTE

When the NON-VOLATILE RAM has been cleared, the existing calibration values should be "0. ".

- Press "clear" to delete the existing value.
- Enter the calibration parameter for Level 1 indicated on the printout.
- To advance to each additional "level" of the same chemistry, press "2", "3", and "4" as necessary. Press "clear" each time, and enter the corresponding calibration parameter indicated on the printout.

NOTE

Chemistries might have 2, 3, or 4 "levels".

- Press "5" to display the generation number for the chemistry. When the NON-VOLATILE RAM has been cleared, the value will be "-1".
- Press "clear" to delete the generation number.
- Enter the generation number for the chemistry indicated on the printout.
- Press "print" to obtain a printout of the calibration parameters and the generation number that were entered.

NOTE

The software might change the value of the number on the right side of the last decimal position for the calibration parameters you entered.

- Compare the old printout and the new printout to determine if the calibration numbers, including the "-" symbols and the decimal points, were entered correctly.
- Press "chemistry select" to advance to additional chemistries. Repeat this procedure until all calibration parameters have been entered.
- Press "cal mode" to enter the values into the memory in the NON-VOLATILE RAM.

NOTE

After "cal mode" is pressed, a time delay will occur because the computer calculates new checksums using the calibration parameters.

- [3] Determine if the customer wants the results of the test for "Urea Nitrate" indicated as "UREA" or "BUN". Also, determine if the customer wants the results indicated as "mg/dl" or "mmols/L". See the following table and enter the correct options.

Options	Test Results
63 and 92	UREA, mg/dl
64 and 92	-----
63 and 93	BUN, mg/dl
64 and 93	UREA, mmols/L

- [4] Write the date on the printouts. Keep the printouts to use when the data must be entered into the NON-VOLATILE RAM again, or store them in the customer copy of the Test Methodologies publication for the Kodak Ektachem DT SYSTEM.

Option 16 Checkout Procedure

Purpose:

To check the accuracy of the results of white reference readings for each LED and of a black reference reading.

Specifications:

When option 16 is executed for each LED, the A/D values for the 5 white reference readings should be +3650 to +3850, and within 10 units of each other.

When option 16 is executed for "LED OFF", the A/D values for the 5 black reference readings should be -100 to +100, and within 10 units of each other.

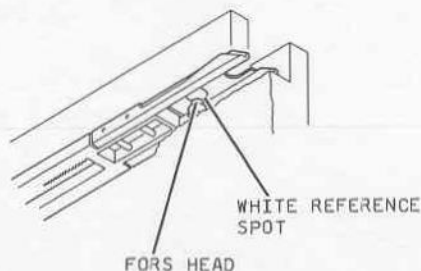
Special Tools:

None

When to Do:

- After the HOME SENSOR and LOWER RACK are adjusted.
- During the adjustment of the FORS ASSEMBLY. NOTE: The option 16 checkout is included in the procedure.

- [1] To place the WHITE REFERENCE SPOT over the FORS HEAD, enter Option 2.



- [2] Execute Option 16 to obtain A/D readings of the LOWER RACK for each color LED and for "LED OFF".
- Execute Option 16, 4 times.
 - For "LED#?", select a different number 6 - 9 each time.
 - For "ENTER STEP CNT (-255 TO 255)", enter the number 0 each time.
 - For "ENTER # OF READS (1 TO 99)", enter the number 5 each time.

- [3] Check the printout for the A/D values.
- The values for the LED Nos. 6, 7, and 8 should be +3650 to +3850.
- The values for the LED No. 9, or "LED OFF", should be -100 to +100.
- The 5 values in each group should be within 10 units of each other.

- [4] Are all A/D values within the correct ranges?



Advance to
step 5.



Advance to
step 4.

- [5] Do the adjustment for the FORS ASSEMBLY. See the Adjustments and Special Procedures section of the service publication.

- [6] Do the Dr Procedure. See the Adjustments and Special Procedures section of the service publication.

- [7] Is the Dr Procedure successful?



This procedure
is completed.



Advance to
step 8 of this
procedure.

- [8] Do the procedure to calculate and update the black and white correction factors. See the Adjustments and Special Procedures section of the service publication.

Kodak Ektachem DT PIPETTE - Checkout Procedure

Purpose:

To check that the Kodak Ektachem DT PIPETTE operates correctly. For additional information, see the instruction manual for the Kodak Ektachem DT PIPETTE. A copy of this publication is included in General Information, section 1 of the service manual.

Specification:

When the DT PIPETTE operates correctly, the same volume of fluid should be aspirated and dispensed each time the DT PIPETTE is used.

When to Do:

- When the results are not precise and accurate for any test that is sensitive to metering malfunctions. See "Problems with Precision and Accuracy" in the Diagnostics, section 5.
- When you observe that the DT PIPETTE does not operate normally or is not maintained correctly by the customer.

NOTE

The customer should check the DT PIPETTE each day.

Special Tools and Materials:

IMPORTANT

Do not use "carbon" batteries.

New 9 V Kodak Supralife "alkaline" BATTERY, or
other new 9 V "alkaline" BATTERY
Laboratory tissues

Description:

- Check the battery in the DT PIPETTE and install a replacement if necessary.
- Clean the PROBOSCIS, if necessary.
- Check that the TIP is correct.
- Check that the DT PIPETTE aspirates and dispenses the correct volume of fluid.
- Process some slides with control fluid and check that the results are correct.

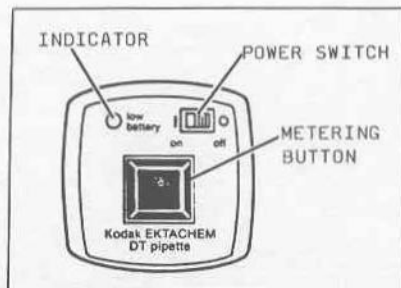
IMPORTANT

The following table includes the same instructions that are provided for the customer in the "Troubleshooting" section of the instruction manual for the DT PIPETTE. Customers should have done the steps in the table before a service call is made.

Possible Causes	Recommended Actions
<ul style="list-style-type: none">- The red DOT is not visible in the READ WINDOW.	<ul style="list-style-type: none">- Reset the DT PIPETTE by moving the POWER SWITCH to the "off" position, then to the "on" position. Check to see if the red DOT is now visible.- Energize the battery by connecting the DT PIPETTE to the RECHARGE UNIT. See "How to Charge the Battery", in the instruction manual for the DT PIPETTE. A copy of the publication is in General Information, section 1 of this service manual.- Clean the PIPETTE and reset it again. See "Cleaning the DT PIPETTE" in the instruction manual for the DT PIPETTE.- If the red DOT is not visible after the battery is energized, and the PIPETTE has been cleaned and reset, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.
<ul style="list-style-type: none">- A leakage from the TIP occurs after fluid is aspirated.	<ul style="list-style-type: none">- Install a new TIP and aspirate fluid. Check for any leakage.- Check that the TIP is fully seated.- Check that the temperature of the fluid is the same as the temperature in the room.- If the leakage continues, obtain help from the Customer Support Center in Rochester. The telephone number is 800/528-0098.
<ul style="list-style-type: none">- The DT PIPETTE makes 4 "beep" sounds and the "low battery" INDICATOR is energized.	<ul style="list-style-type: none">- Use the RECHARGE UNIT to apply a charge to the battery.

To Check:

- [1] To check the battery in the DT PIPETTE, do:
- Observe the "low battery" INDICATOR.
 - If the "low battery" INDICATOR is energized, install a new 9 V "alkaline" battery.
 - If the INDICATOR continues to be energized after a new battery is installed, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

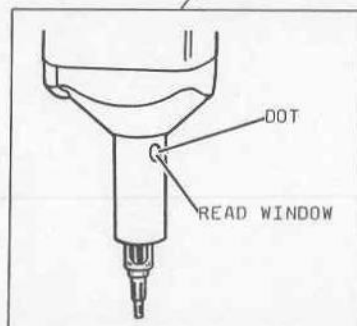
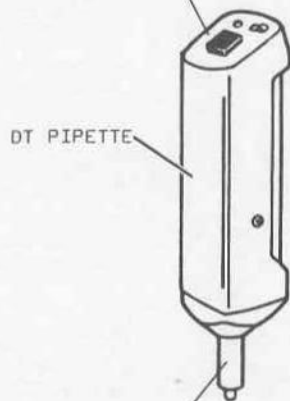


- [2] To determine if cleaning the PROBOSCIS is necessary, check:
- Hold the DT PIPETTE in a vertical position and observe the READ WINDOW. A red DOT should be visible in the READ WINDOW.

NOTE

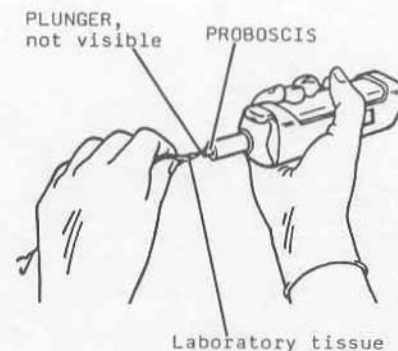
The DT PIPETTE makes one sound when the METERING BUTTON is pressed.

- If the DOT is not visible, press the METERING BUTTON and check READ WINDOW again.
- If the DOT is not visible after the METERING BUTTON is pressed, move the POWER SWITCH to the "off" position, then to the "on" position, to reset the DT PIPETTE. Continue observing to determine if the PLUNGER in the DT PIPETTE moves down to place the DOT in the READ WINDOW. After the PLUNGER has moved, the PIPETTE should make another sound.

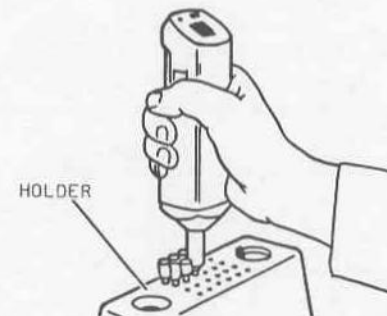


- [3] Check the hole in the PROBOSCIS for dry serum or plasma.

- [4] If the PLUNGER in the DT PIPETTE did not move to place the red DOT in the READ WINDOW, or if the hole in the PROBOSCIS is dirty, use a laboratory tissue and distilled or "deionized" water to clean the PIPETTE and remove the dried fluids. See "Cleaning the DT Pipette" in the instruction manual for the DT PIPETTE. A copy of this publication is included in General Information, section 1 of the service manual.

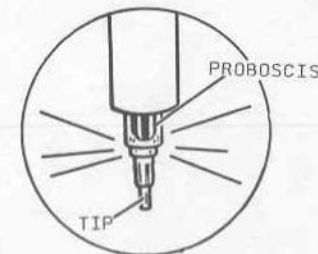


- [5] Do step 2 again to determine if the PLUNGER operates correctly. If a sound did not occur and if the red DOT is not visible in the READ WINDOW, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.



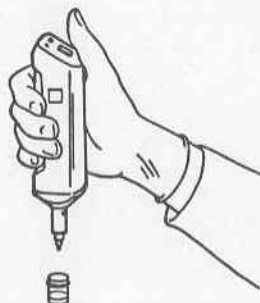
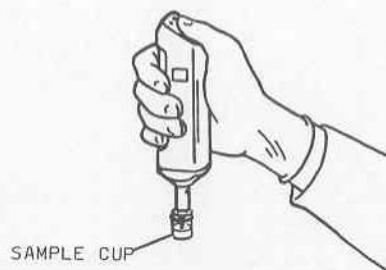
- [6] To check that the TIPS are correct, do:

- Install a new TIP from the HOLDER on the end of the PROBOSCIS. Check that the TIP makes a sound when it seats on the PROBOSCIS. See "Using the DT Pipette to Process Tests" in the instruction manual for the DT PIPETTE. A copy of this publication is included in General Information, section 1 of the service manual.
- Check that the top of the TIP reaches the bottom of the PROBOSCIS when the TIP is installed.



[7] To check that the DT PIPETTE aspirates and dispenses the correct volume of fluid, do:

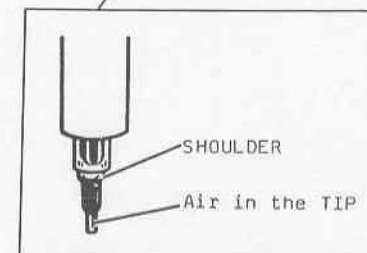
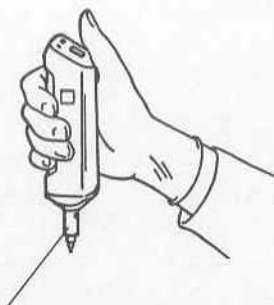
- Aspirate fluid from a SAMPLE CUP, and lift the PIPETTE to remove the TIP from the fluid immediately. The DT PIPETTE should make only one sound when the METERING BUTTON is pressed, and the PIPETTE should be lifted from the fluid before another sound occurs.



- After the TIP is removed from the fluid, use a dry tissue to remove fluid from the exterior surface of the TIP.



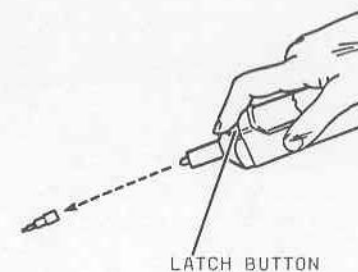
- Observe the fluid in the TIP. The TIP should be filled with fluid up to the SHOULDER, and should have a small volume of air in the end of the TIP.
- Place a laboratory tissue under the end of the TIP, and dispense the fluid into the tissue.
- Check that the DT PIPETTE makes one sound after the METERING BUTTON is pressed.
- Check that the fluid is fully dispensed.
- Check that the red DOT is visible in the READ WINDOW after the fluid is dispensed.



[8] To eject the TIP, press the LATCH BUTTON.

[9] In step 7, if the DT PIPETTE did not aspirate fluid and air correctly, or dispense fluid correctly, do steps 2 - 8 again. If the DT PIPETTE does not operate correctly, obtain help from the Customer Support Center in Rochester. The telephone number is 800/521-0098.

[10] If the DT PIPETTE operated correctly in step 7, process 2 or 3 slides with control fluid. Compare the results with the data provided with the control fluid.



[11] If the results for step 10 are not the same as the values for the control fluid, obtain help from the Customer Support Center in Rochester.

Checkout Procedure for the POWER SUPPLY - DT60 ANALYZER

Purpose:

Intermittent power problems and interruptions of power, both internal and external, can cause malfunctions in the DT60 ANALYZER and the DTE MODULE. Power malfunctions can cause malfunctions of the memory, the slide reading, and the data processing functions in the equipment.

This procedure checks the power to and from the POWER SUPPLY within the DT60 ANALYZER only.

Specifications:

Voltage Measurement:	+	-	Specifications: V dc
+5 V dc circuit from POWER SUPPLY	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit from POWER SUPPLY	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit from POWER SUPPLY	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit from POWER SUPPLY	FAN, J11-1	FAN, J11-22	+11.0 to +13.0

Special Tools:

MULTIMETER TL-3424
FORS ADJUSTMENT TL-3340
CONTACT LUBRICANT TL-3773

To check the POWER SUPPLY:

IMPORTANT

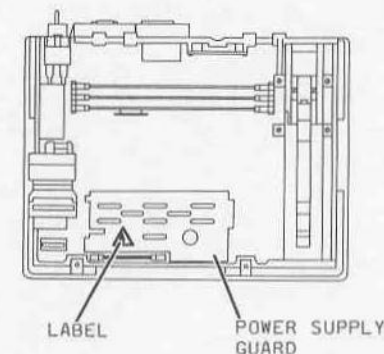
The DT60 ANALYZER will not operate correctly if the power at the site is not within the recommended specifications.

- [1] To check the power at the customer site, do:
- Check that the ac input power to the DT60 ANALYZER is within the specifications. See the Site Specifications section of the service publication.
 - Check the wall receptacle for correct earth ground.
 - If the main power at the customer site is not within the specifications, provide the information to the customer. The customer is expected to provide site conditions that are within the operating specifications for the equipment.

IMPORTANT

If TL-3773 has been applied, do not apply any additional lubricant.

If TL-3773 has been applied, "TL-3773" and a date should be indicated on a LABEL that is installed on the POWER SUPPLY GUARD.

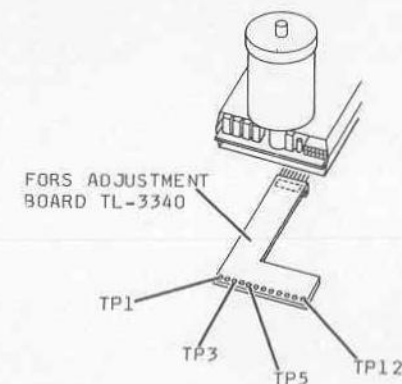


- [2] Check to see if CONTACT LUBRICANT TL-3773 has been applied and, if necessary, apply it. See the special procedure, "Applying CONTACT LUBRICANT TL-3773".

IMPORTANT

The +5 V dc is the most sensitive circuit and should be adjusted correctly before adjusting the other voltages.

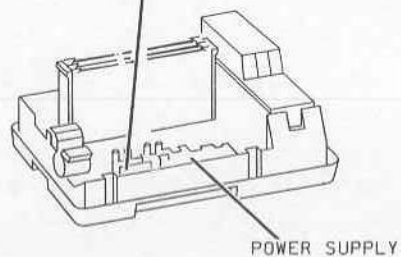
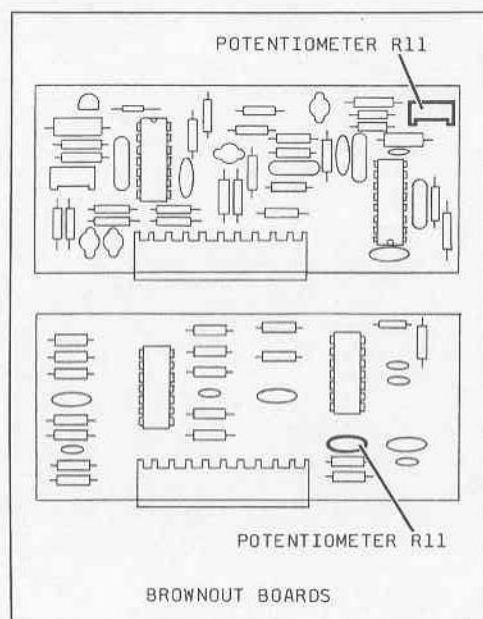
- [3] Connect the FORS ADJUSTMENT BOARD TL-3340. Use the MULTIMETER TL-3424 to check that the +5 V dc signal from the POWER SUPPLY is within specifications. See the specifications table.



- [4] If the +5 V dc signal is not within the specifications, adjust POTENTIOMETER R11 on the BROWNOUT BOARD until the +5 V dc signal is +5.0 V dc. R11 adjusts the gain for all voltages.

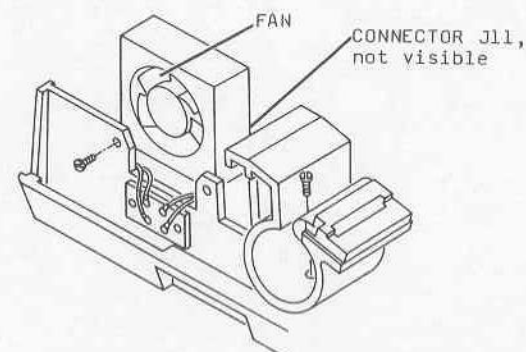
NOTE

The BROWNOUT BOARD has 2 different configurations. See the figure below to identify the configuration of the BROWNOUT BOARD on the POWER SUPPLY you are diagnosing.



- [5] Use the MULTIMETER TL-3424 with the FORS ADJUSTMENT BOARD TL-3340 and check the +15 Vdc and the -15 V dc signals from the POWER SUPPLY. See the specifications table on the first page of this procedure.

- [6] Connect the MULTIMETER TL-3424 to CONNECTOR J11 for the FAN and check the +12 V dc signal from the POWER SUPPLY. See the specifications table.



- [7] If any voltage is not within the specifications, install a replacement for the POWER SUPPLY. See Parts and Removals for the DT60 ANALYZER, section 10 of the service manual.

- [8] Begin this procedure again to check the new POWER SUPPLY.

TEMPERATURE PROBE TL-2598 — Checkout

Purpose: To determine any variation in the temperature reading.

Specification:

- The difference in temperature with the THERMOMETER and the TEMPERATURE PROBE should be less than 0.3°C (0.5°F). If the difference is greater, it is used as a correction factor.

When to Do:

- A minimum of 2 times a year.
- Whenever a new TEMPERATURE PROBE TL-2598 is received.

Special Tools and Materials:

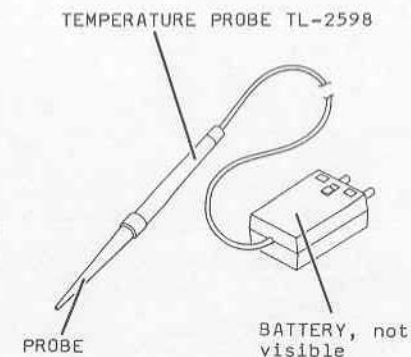
THERMOMETER
TEMPERATURE PROBE TL-2598
MULTIMETER TL-3424

Description: To obtain the correct temperature reading, you must:

- Check the temperature of warm water with a THERMOMETER.
- Check the temperature of the water with TEMPERATURE PROBE TL-2598.
- Compare the 2 measurements.
- Use the difference as a correction factor for temperature measurements made with TL-2598.

If the TEMPERATURE PROBE TL-2598 has excessive wear or roundness, it will not make even contact with the surface of the Spotting Station.

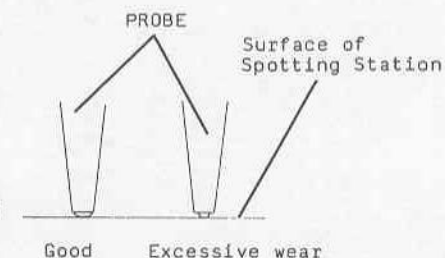
- [1] Check the TEMPERATURE PROBE TL-2598 for excessive wear.



The TEMPERATURE PROBE TL-2598 operates with a BATTERY. If the BATTERY is low, the accuracy of the temperature reading will be erratic.

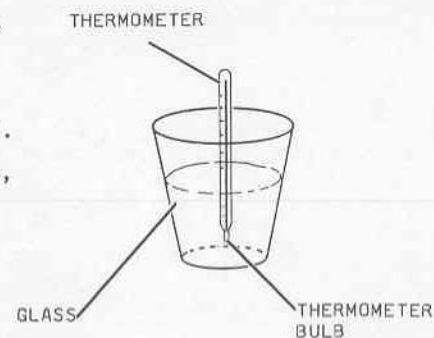
- [2] Do the following to check that the BATTERY is not low:

- Hold the PROBE firmly against the center of your hand.
- Check that the temperature is 34 to 37°C (93.2 to 98.6°F).
- If the temperature is too low, install a new BATTERY.



- [3] Fill a GLASS with warm water, approximately 36 to 38°C (99 to 100°F).

- [4] Insert a THERMOMETER into the water and record the temperature.



[5] Connect the TEMPERATURE PROBE TL-2598 to the MULTIMETER TL-3424.

[6] Insert the PROBE into the water and record the temperature.

NOTE

The PROBE should be adjacent to the THERMOMETER BULB and not touching the bottom of the GLASS.

[7] Do the temperatures that you recorded in steps 4 and 6 have a difference of less than 0.3°C (0.5°F)?



The procedure
is completed.



Advance to
step 8.

[8] Record the difference between the 2 temperatures. Use the difference as a correction factor when you use the TEMPERATURE PROBE TL-2598 to determine temperatures.

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Kodak Ektachem DTE MODULE Adjustments and Special Procedures Section 9

.....
: CAUTION :
.....



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Adjustments

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Special Procedures

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BAR CODE READER – Voltage

Purpose: As an inserted slide moves to the Spotting Station, the BAR CODE READER emits a light beam from an LED that scans the bar code on the slide. Some of this light is reflected from the slide down to the BAR CODE READER. The BAR CODE READER then transmits a voltage signal which corresponds to the amount of light reflected from the black and white lines in the bar code. The software can decode the information to obtain the chemistry and generation number of the inserted slide.

POTENTIOMETER R30 on the INTERFACE CIRCUIT BOARD sets the gain for the voltage signal from the BAR CODE READER. The objective of this adjustment is to set the POTENTIOMETER to provide a signal at an optimum voltage that can be read within the operating parameters. If the BAR CODE READER is not adjusted correctly, the system will not be able to detect the difference between the signals for the black and white lines.

The BAR CODE READER on the DT60 ANALYZER must be adjusted both for focus and adjustment. Because the focus of the BAR CODE READER in the DTE MODULE is permanently set, only the voltage is adjusted.

The BAR CODE SLIDE TL-3482 provides a surface with uniform white reflectance, to enable you to set the voltage with precision.

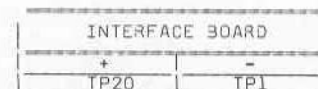
Description: To obtain the correct adjustment, you must:

- Insert slides at different speeds to see if an adjustment is necessary.
- Insert the BAR CODE SLIDE TL-3482.
- Adjust POTENTIOMETER R30 to provide the correct voltage.

When to Do:

- When potentiometric slides are not identified correctly.
- After installing a new BAR CODE READER.

Specifications: After inserting BAR CODE SLIDE TL-3482, obtain - 5.25 to -5.75 V dc, at:



Special Tools: MULTIMETER TL-3424
BAR CODE SLIDE TL-3482

Potentiometer: R30 on the INTERFACE CIRCUIT BOARD

To Check:

In steps 1 and 2 you will check to see if an adjustment is necessary. You will test the operation of the BAR CODE READER by inserting slides from different chemistries, to see if they are identified correctly. To check that the BAR CODE READER operates correctly at all loading speeds, you will insert some of the slides slowly, and some of the slides fast.

- [1] Use the SLIDE ADVANCE LEVER to insert slides for different chemistries over the BAR CODE READER. Insert some slides at slow speed, 5 cm (2 inches) per second. Insert other slides at fast speed, 35 cm (14 inches) per second.

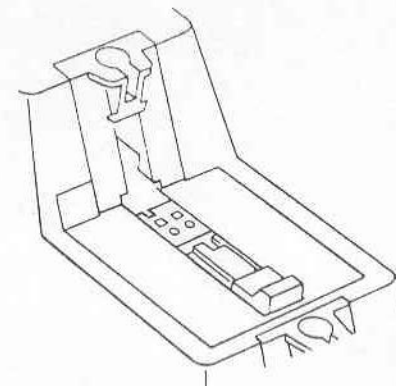
- [2] Is the message "SPOT SLIDE WITH FLUID" displayed each time a slide is inserted?



The BAR CODE READER operates correctly. The procedure is completed.



Advance to step 3.

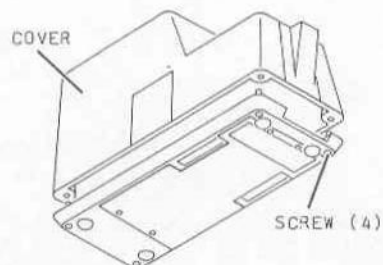


SLIDE ADVANCE LEVER

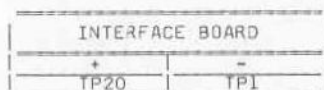
To Adjust:

In steps 3 to 9 you will adjust POTENTIOMETER R30 on the INTERFACE BOARD to set the gain to provide a signal with the optimum voltage.

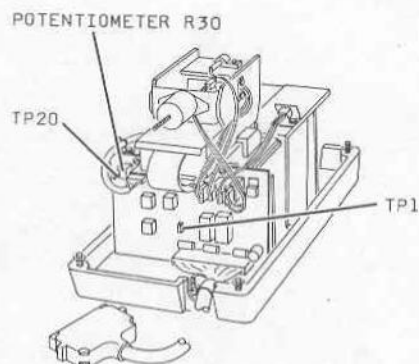
- [3] Loosen the 4 SCREWS and remove the COVER.



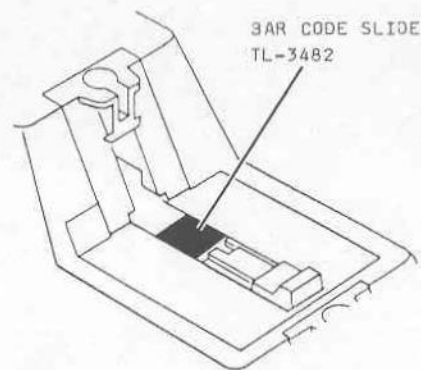
- [4] Connect the MULTIMETER TL-3424:



- [5] Insert the BAR CODE SLIDE TL-3482 above the BAR CODE READER, with the white surface down.



- [6] Rotate POTENTIOMETER R30 on the INTERFACE BOARD until the voltage is -5.25 to -5.75 V dc.



- [7] Disconnect MULTIMETER TL-3424.

- [8] Remove the BAR CODE SLIDE TL-3482.

- [9] Install the COVER and tighten the 4 SCREWS.

Checkout For Correct Adjustment:

- [10] Insert slides for different chemistries, at fast and slow speeds. Check that the slides are correctly identified.

ELECTROMETER CONTACTS - Compression - Type 1 ELECTROMETER ASSEMBLY

Purpose:

To adjust the ADJUSTMENT SCREWS on the ELECTROMETER so that all 4 CONTACTS touch the slide with the same force. Each CONTACT should be pressed a minimum distance into the ELECTRODE of the slide.

- Illustration A indicates the correct positions of the CONTACT and the ELECTRODE.

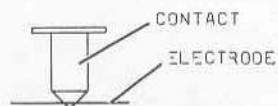


Illustration A

- Illustration B indicates the result of excessive force. The CONTACT is pressed too far into, or through the ELECTRODE. If holes larger than the diameter of the CONTACTS are made, the result might be an inaccurate reading because of intermittent or no electrical contact. Excessive compression can cause the CONTACTS to hit the surface of the INCUBATOR when no slide is in the Spotting Station.

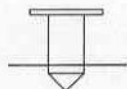


Illustration B

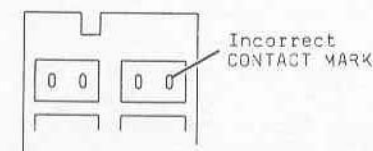
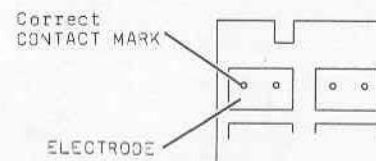
- Illustration C indicates the result of not enough force. The CONTACT does not touch the ELECTRODE and no reading can be made.



Illustration C

Specifications:

- When a slide is in the Spotting Station, the ELECTROMETER CONTACTS should compress 0.75 to 1.0 mm (0.03 to 0.04 in.).
- When the compression is adjusted correctly, the 4 CONTACTS should puncture the ELECTRODES on the slide and make 4 small holes in the emulsion. These holes should be visible using MAGNIFIER TL-1442 when the slide is placed in front of a light source. The ELECTRODES should not be scratched adjacent to the punctured holes. See the illustrations for examples of CONTACT MARKS that are correct and not correct.



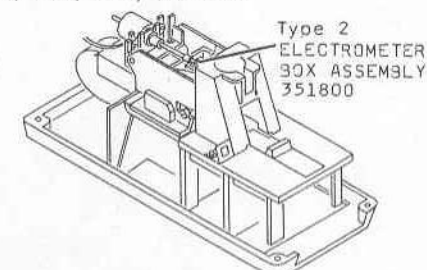
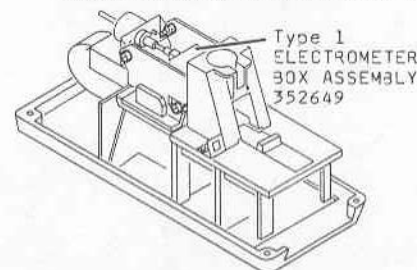
- The result of the Contact Verification Test should be a "MV" value of -5.0 to +5.0. If necessary, see the procedure in the adjustments section for the DTE MODULE.

When to Do:

IMPORTANT

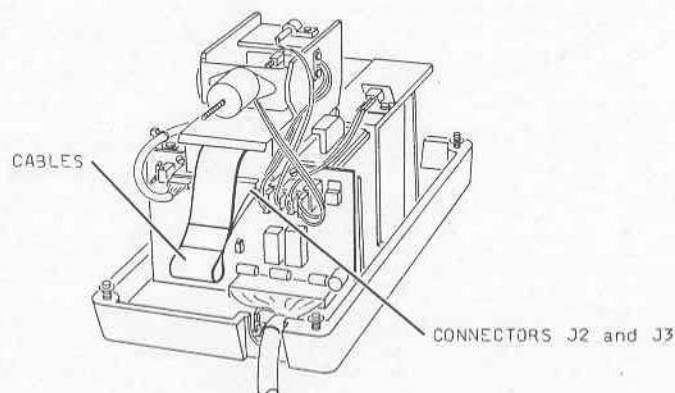
Do not do this adjustment for the Type 2 ELECTROMETER BOX ASSEMBLY, part number 351800.

- When a new Type 1 ELECTROMETER BOX ASSEMBLY 352649 is installed.
- When the results for potentiometric tests or quality control are not accurate.
- When diagnosing error codes E13, E14, E19, and E20.



Special Requirements:

For Type 1 ELECTROMETER ASSEMBLY only, check that adhesive tape has been applied to the CABLES for CONNECTORS J2 and J3. If necessary, see the adjustment for the HOME POSITION SENSOR in the DTE MODULE.



Special Tool:

MAGNIFIER TL-1442

Description:

With a slide in the Spotting Station, you will check that the bottom surface of the ELECTROMETER ASSEMBLY moves parallel to the SLIDE TRACK.

Next, you will adjust the ADJUSTMENT SCREWS so that the ELECTROMETER CONTACTS are lifted a minimum distance off the slide.

Then you will adjust the compression distance, or compression force, by adjusting the ADJUSTMENT SCREWS so that the ELECTROMETER CONTACTS are compressed 0.75 to 1.0 mm (0.03 to 0.04 in.) when they touch down on the slide.

ELECTROMETER CONTACTS - Compression
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To Check:

- [1] Remove and discard any used slides from the DISPOSAL CUP.
- [2] Place a potentiometric slide on the SLIDE PATH in the Kodak Ektachem DTE MODULE. Push the MANUAL PUSHER to advance the slide to the Spotting Station.

.....
• CAUTION •
.....

Avoid damage to the ELECTROMETER CONTACTS. Do not allow the ELECTROMETER ASSEMBLY to move to the reading position without a potentiometric slide in the Spotting Station.

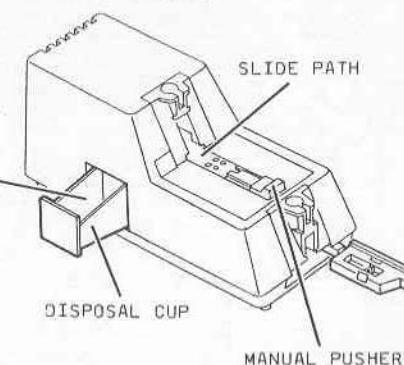
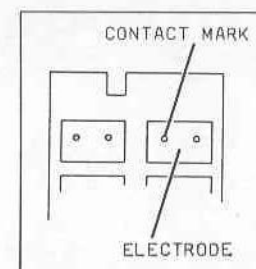
- [3] Enter option 42 and the number 1 to operate the ELECTROMETER for one cycle. CONTACT MARKS will be made on the ELECTRODES of the slide.
- [4] Place another potentiometric slide on the SLIDE PATH and push the MANUAL PUSHER to advance the slide to the Spotting Station, and to move the first slide into the DISPOSAL CUP.
- [5] Remove the slide from the DISPOSAL CUP. Use MAGNIFIER TL-1442 and check that the CONTACT MARKS on the ELECTRODES are correct.



Advance to
step 6.



Advance to
step 8.



ELECTROMETER CONTACTS - Compression
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[6] Do the Contact Verification Test, and check the printout for the "MV" value.

[7] Is the "MV" value on the printout -5.0 to +5.0?



Stop. No adjustment is necessary.



Advance to step 8.

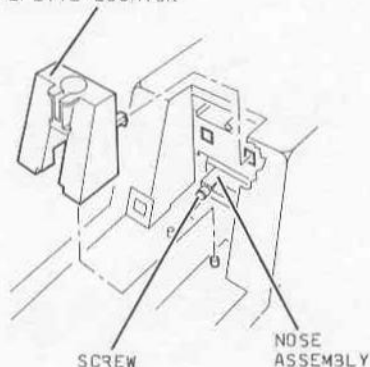
[8] Remove the SPOTTING STATION PIPETTE LOCATOR.

.....
• CAUTION •
.....

Possible damage from electrostatic discharge.

Avoid damage to the ELECTROMETER CONTACTS.

SPOTTING STATION PIPETTE LOCATOR



[9] Loosen the SCREW and remove the NOSE ASSEMBLY.

IMPORTANT

Type 2 ELECTROMETER ASSEMBLIES do not have ADJUSTMENT SCREWS. The compression of the ELECTROMETER CONTACTS cannot be adjusted.

[10] Does the ELECTROMETER ASSEMBLY have 2 ADJUSTMENT SCREWS?

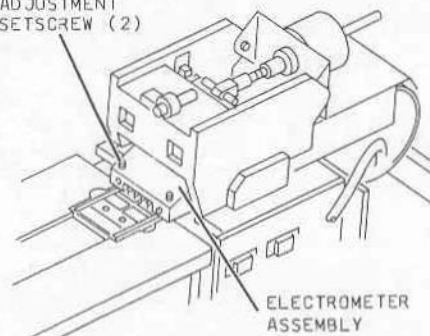


Advance to step 13.



Advance to step 11.

ADJUSTMENT SETSCREW (2)



[11] Install a replacement for the ELECTROMETER ASSEMBLY.

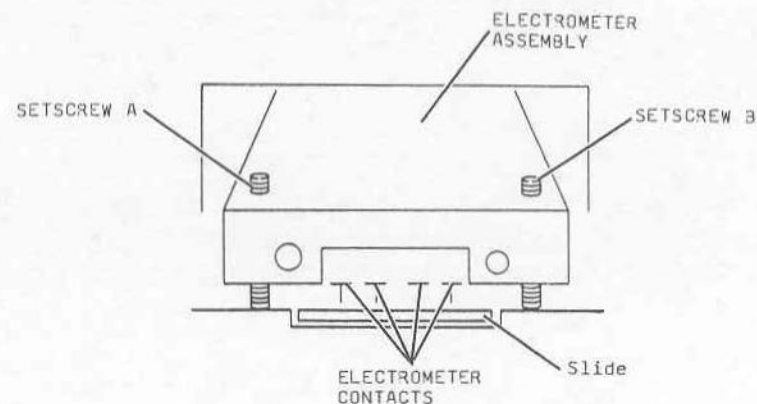
[12] Do steps 1 - 6 to check the compression and the contact verification.

To Adjust:

[13] Enter option 40 to move the ELECTROMETER ASSEMBLY to the reading position.

[14] Rotate SETSCREW A counterclockwise until the bottom of the SETSCREW is not visible.

[15] Rotate SETSCREW 3 clockwise one full rotation.

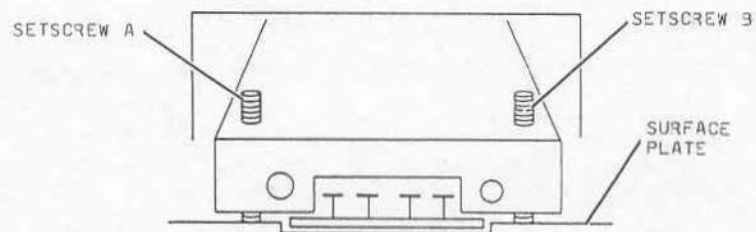


.....
• CAUTION •
.....

Avoid damage to the ELECTROMETER CONTACTS. Do not allow the ELECTROMETER ASSEMBLY to move to the reading position without a potentiometric slide in the Spotting Station.

[16] Enter option 42 and the number 1 to operate the ELECTROMETER for one cycle. The slide loaded in step 2 should remain in the Spotting Station.

- [17] Rotate SETSCREW B counterclockwise until the ELECTROMETER CONTACTS have minimum contact with the ELECTRODES on the slide.
- [18] To set the correct compression, rotate SETSCREW B an additional 1.0 to 1.75 counterclockwise rotation.
- [19] Rotate SETSCREW A until the bottom of the SETSCREW has minimum contact with the SURFACE PLATE.



- [20] Do steps 1 - 6 again to check the adjustment.
- [21] Install the NOSE ASSEMBLY and tighten the SCREW.
- [22] Install the SPOTTING STATION PIPETTE LOCATOR.

HOME POSITION SENSOR – Alignment

Purpose:

The software monitors the position of the ELECTROMETER by monitoring the status of the HOME SENSOR when the LINEAR ACTUATOR is operating to move the ELECTROMETER. The software expects the status of the HOME SENSOR to be HI when the ELECTROMETER is in the home position, and the FLAG is in the SENSOR. When the LINEAR ACTUATOR drives the ELECTROMETER from the home position and the FLAG is not in the SENSOR, the software expects the status of the HOME SENSOR to be Lo. The software also monitors the number of Motor Steps during the operation of the LINEAR ACTUATOR.

The FLAG must be in the HOME SENSOR within the number of steps determined by the software. If the status of the HOME SENSOR is HI after the LINEAR ACTUATOR starts and drives the ELECTROMETER toward the Read Station, or if the ELECTROMETER does not return to the home position within the step count specifications, error code F20 will occur.

The adjustment procedure for the HOME SENSOR places the SENSOR in the correct position. If the HOME SENSOR is adjusted too near to the back of the DTE MODULE, error code F20 can occur. If the SENSOR is adjusted too near to the front, the NOSE ASSEMBLY can obstruct the TIPS and cause damage to the PIPETTE.

This adjustment also includes steps to prevent excessive horizontal movement of a Type 1 ELECTROMETER. Horizontal movement must be at a minimum to prevent damage to the CONTACTS.

Specifications:

- The SENSOR must be in the position that allows the FLAG to enter the SENSOR within the step count determined by the software and the NOSE ASSEMBLY does not obstruct the TIPS.
- Error code F20 does not occur when option 42 is entered for 2 cycles.

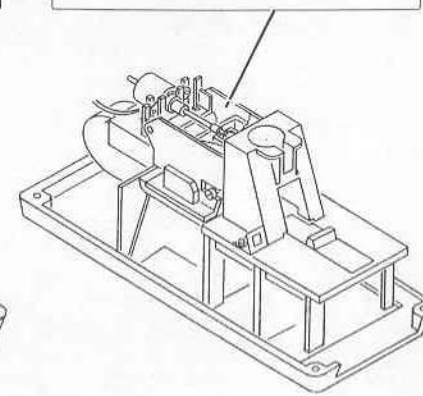
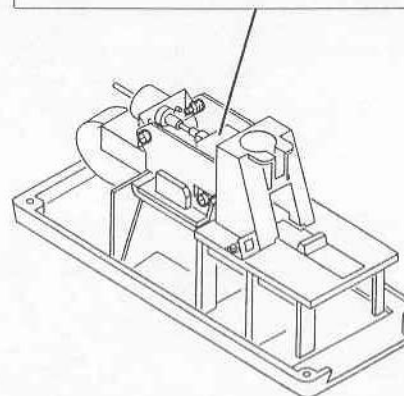
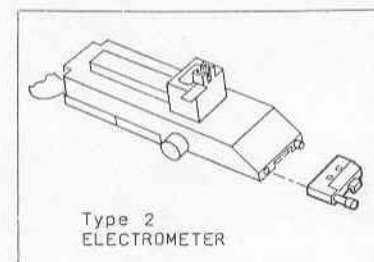
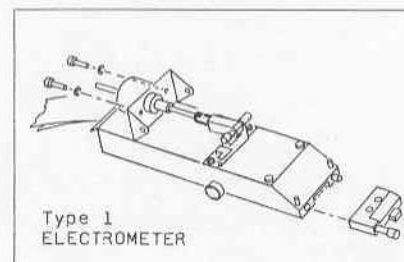
When to Do:

- When error code F20 occurs.
- When the NOSE ASSEMBLY obstructs the TIPS on the PIPETTE.
- After installing a new ELECTROMETER. First, check for obstruction from the NOSE ASSEMBLY and execute option 42 for 2 cycles to check for error code F20.

Description:

To obtain the correct adjustment, you must:

- Check for excessive horizontal movement of any Type 1 ELECTROMETER and place tape on the CABLES if necessary. This procedure is not necessary for the Type 2 ELECTROMETER.
- Check the operation of the SENSOR and adjust the position of the SENSOR.
- Check that the NOSE ASSEMBLY does not obstruct the TIPS on the PIPETTE. Make an additional adjustment in the position of the SENSOR, if necessary.



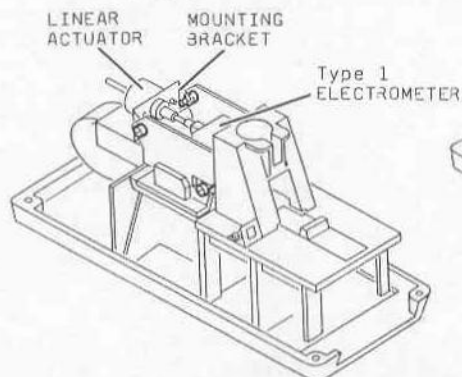
To Check:

- [1] Loosen the 4 SCREWS and remove the COVER.

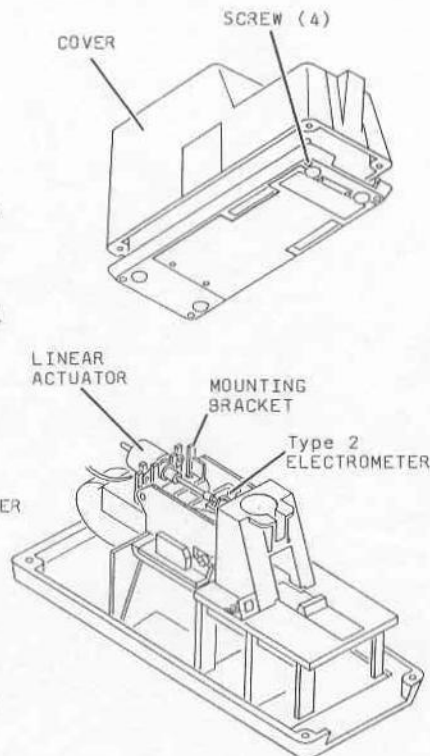
- [2] Determine if the ELECTROMETER is Type 1 or Type 2.

NOTE

The difference between Type 1 and Type 2 can be identified by observing the MOUNTING BRACKET for the LINEAR ACTUATOR.



Advance to step 3.



Advance to step 9.

Excessive horizontal motion of Type 1 ELECTROMETERS might cause damage to the CONTACTS. Steps 3 to 8 are necessary only for Type 1 ELECTROMETERS.

- [3] Execute option 42 for 2 cycles. Observe the horizontal motion of the ELECTROMETER.

- [4] Did error code F20 occur?



Do the diagnostic procedure for F20.



Advance to step 5.

- [5] Is the horizontal motion at a minimum?



Advance to step 9.



Advance to step 6.

- [6] Enter option 41 to move the ELECTROMETER to the home position.

- [7] Is TAPE applied to the CABLES for CONNECTORS J2 and J3?



Advance to step 9.



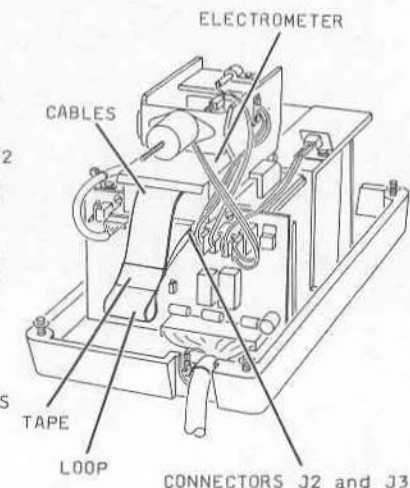
Advance to step 8.

IMPORTANT

Before you do step 8, the CABLES must be in the position indicated in the figure. If the CABLES are not in the correct position, CONNECTORS J2 and J3 could pull out when the ELECTROMETER moves to the read position.

After the tape is applied, the LOOP must be toward the bottom of the DTE MODULE when the ELECTROMETER is in the home position.

- [8] Place 12.5 mm (0.50 in.) adhesive tape around the CABLES 12.5 mm (0.50 in.) from the bottom of the LOOP.



Signals from the HOME SENSOR are monitored only when the software drives the ELECTROMETER to the Read Station or to the home-position. The software does not monitor the HOME SENSOR at other times. Error code F20 can occur only during the motion of the ELECTROMETER.

[9] If necessary, enter option 41 to move the ELECTROMETER to the home-position.

[10] Is the FLAG in the SENSOR and is LED DISPLAY DS10, on the INTERFACE BOARD, energized?



Advance to step 17.



Advance to step 11.

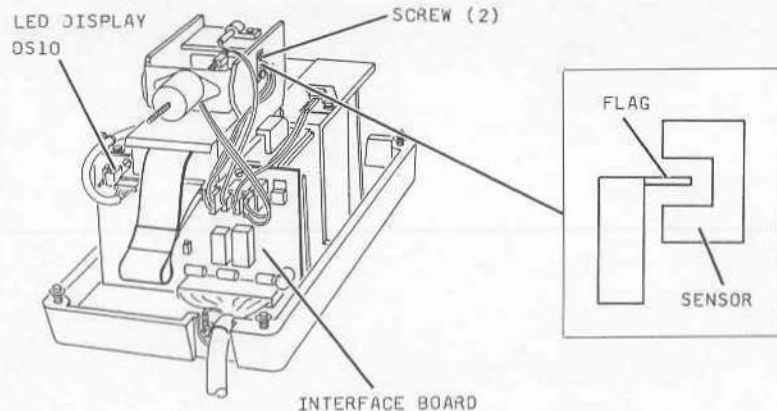
To Adjust:

[11] Loosen the 2 SCREWS.

[12] Observe LED DISPLAY DS10 and move the SENSOR until the FLAG closes the SENSOR. DS10 is energized when the FLAG is in the SENSOR.

[13] Tighten the 2 SCREWS.

[14] Execute option 42 for 1 cycle to check that the adjustment is correct.



[15] Is the FLAG in the SENSOR and is DS10 energized?



Advance to step 17.



Advance to step 16.

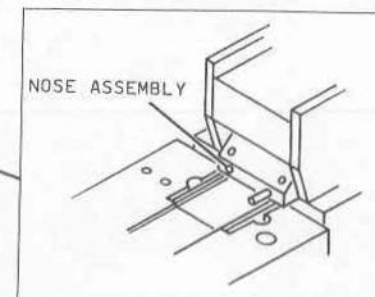
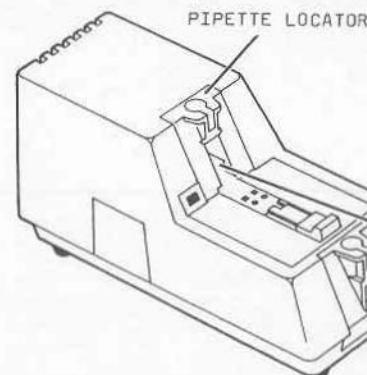
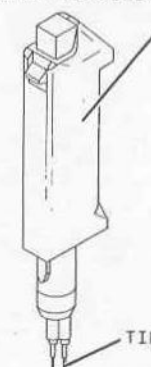
[16] Do steps 11 to 16 again. Check for mechanical binds.

In steps 17 and 18, you will check that the NOSE ASSEMBLY does not obstruct the TIPS when the ELECTROMETER is in the home-position. If an additional adjustment is necessary, you will do steps 19 to 23.

[17] To check that the NOSE ASSEMBLY does not obstruct the TIPS, do:

- Enter option 41 to move the ELECTROMETER to the home-position.
- Place TIPS on the Kodak Ektachem DTE PIPETTE.
- Insert the PIPETTE into the PIPETTE LOCATOR and observe the TIPS and the NOSE ASSEMBLY.

Kodak Ektachem DTE PIPETTE



[18] Do the TIPS touch the NOSE ASSEMBLY?



Advance to
step 19.



Advance to
step 22.

[19] Loosen the 2 SCREWS.

[20] Move the SENSOR 1 mm
(0.04 in.) toward the back
of the DTE MODULE.

[21] Tighten the 2 SCREWS.

[22] Remove the DTE PIPETTE.

[23] Execute option 42 for 2
cycles to check the
adjustment.

[24] Is the HOME SENSOR adjusted to the specifications?



Advance to
step 26.



Advance to
step 25.

[25] Do steps 19 to 24 again.

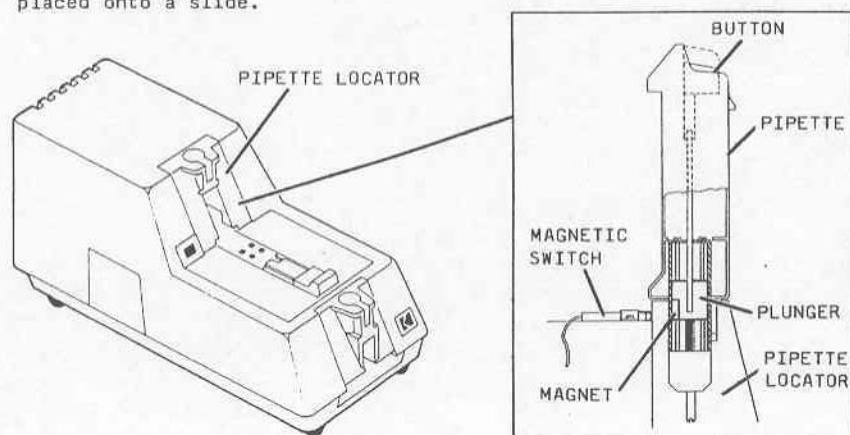
[26] Install the COVER and tighten the 4 SCREWS.

[27] Return the DTE MODULE to normal operation.

MAGNETIC SWITCH – Alignment

Purpose: When the BUTTON on the DTE PIPETTE is pressed, a MAGNET moves down with the PLUNGER. The MAGNETIC SWITCH on the DTE MODULE detects the MAGNET when it moves down. This enables the SWITCH to send a signal indicating that the BUTTON was pressed. This dispensing operation must be completed with the TIPS installed on the DTE PIPETTE.

If the MAGNETIC SWITCH is not flush with the front of the PIPETTE LOCATOR, the it might not detect that a drop of fluid has been placed onto a slide.

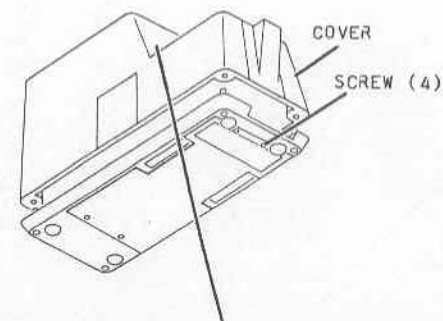


Specification: The front of the MAGNETIC SWITCH should be flush with the PIPETTE HOLDER.

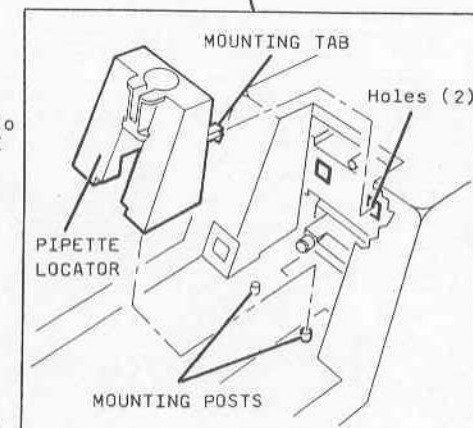
When to Do: When a drop is dispensed onto a slide, and one or more of the following conditions occur:

- the LED on the DTE MODULE does not flicker,
- a "beep" sound is not provided by the DT60 ANALYZER
- the message "SPOT SLIDE WITH FLUID" is displayed on the LC DISPLAY.

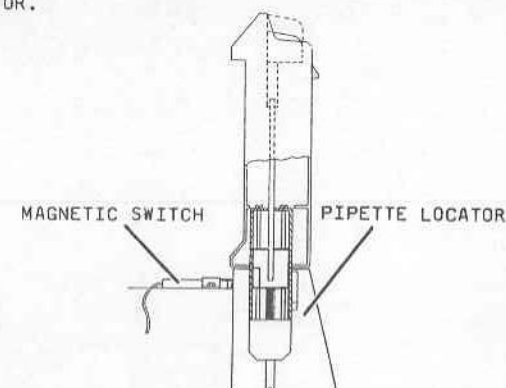
- [1] Loosen the 4 SCREWS and remove the COVER.



- [2] Check that the PIPETTE LOCATOR is mounted correctly. The MOUNTING TABS must be inserted into the 2 holes. The PIPETTE LOCATOR must be seated correctly over the MOUNTING POSTS.



- [3] Move the MAGNETIC SWITCH forward until it is flush with the PIPETTE LOCATOR.



Bias Current Test

Purpose:

To check the internal electrical operation of the ELECTROMETER ASSEMBLY. This test measures the ability of the ELECTROMETER to read correctly the potentiometric slides that have high impedance. The voltage in the system should remain low and stable from slide reading to slide reading. If the test is not successful, a replacement for the ELECTROMETER ASSEMBLY should be installed.

When to Do:

- After installing a new ELECTROMETER ASSEMBLY
- When diagnosing error codes E18 and E19, after obtaining reference and offset values that are within the specifications
- When diagnosing problems with the precision or accuracy of any potentiometric tests.

NOTE

The K+ slides have the highest impedance and are the most sensitive to an excessively high bias current in the ELECTROMETER ASSEMBLY. Na+ slides also have high impedance and are sensitive to high bias current. CO₂ and Cl⁻ are less sensitive to this condition.

- [1] Enter option 43 to reset the ELECTROMETER RELAYS and connect the internal components to a ground.
- [2] Enter option 44 to set the ELECTROMETER RELAYS and to start the bias current test.

- [3] Is "PASS" indicated on the printout?



Advance to step 5.



Advance to step 4.

- [4] If "FAIL" is indicated on the printout, diagnose and repair any malfunction in the temperature control system.

- [5] Wait 10 minutes to allow time for any possible voltage increase to occur.

- [5] Enter option 43 and check the printout.

- [7] Is the "OFST" value 1.2 or less?



Advance to step 8.



Advance to step 10.

- [8] Enter option 43 again, 2 times, and check the printouts.

- [9] Are both "OFST" values for step 8 within 0.5 of the value for step 5?



This test is successful.



Advance to step 10.

- [10] Install a replacement for the ELECTROMETER ASSEMBLY.

- [11] Do steps 1 - 9 again.

Contact Verification Test

Purpose:

To check that the ELECTROMETER CONTACTS have the correct contact with a slide. Version 11.0 software enables an automatic contact checkout for each slide reading. This test can be used for all software versions.

Specification:

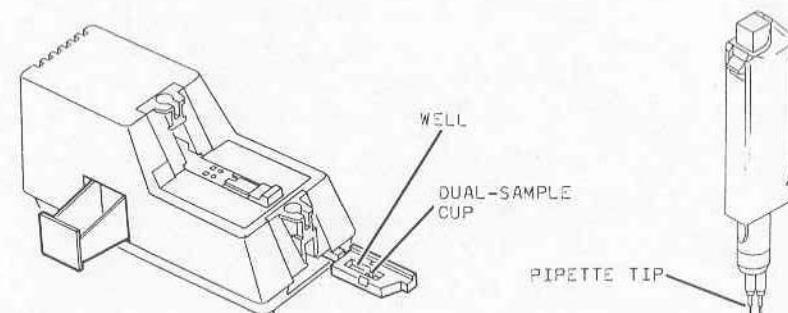
The "MV" value on the printout when REFERENCE FLUID is used in both DROP WELLS of the slide for a potentiometric test should be -5.0 mV to $+5.0$ mV.

When to Do:

- After adjusting the compression of the ELECTROMETER CONTACTS
- After installing a new ELECTROMETER ASSEMBLY
- When diagnosing error codes E11, E12, and E13, after obtaining reference and offset values that are within the specifications
- When diagnosing an error code E14 that occurred either during the service mode after obtaining reference and offset values within the specifications, or an error code E14 that occurred during the "Predict", or operating, mode
- When diagnosing error code E20
- When diagnosing problems with the precision or accuracy of any potentiometric tests

- [1] Enter option 62 and record the test time.
Enter the number 180 for a test time of 180 seconds.
- [2] Enter option 43 to apply an internal reference voltage of 81.8 mV before beginning this test.
- [3] Enter option 14 to provide A/D values with the test results on the printout.
- [4] To enter the operating mode, press "SHIFT" and "service mode".

- [5] Operate the DTS MODULE using Kodak Ektachem ELECTROLYTE REFERENCE FLUID for both drops:
 - Use the REFERENCE FLUID in both WELLS of a clean new DUAL-SAMPLE CUP.
 - Use 2 clean new PIPETTE TIPS on the Kodak Ektachem DTS PIPETTE.
 - Use any new potentiometric slide.



- [6] Check the printout for the "MV" value.

```

NA+
  0. MV
G(MV) = 0.
A/D = -1550
REF = -1621
OFST = -5
TEMP = 2945
    
```

- [7] Is the "MV" value -5.0 to $+5.0$?



The test is
successful.



The test is
not successful.

- [8] Enter option 62 and enter the original test time recorded in step 1.

Reference and Offset Test

Purpose:

To check that the A/D values for the reference and offset voltages remain stable for each test. The reference voltage in the ELECTROMETER is a high limit, and the offset voltage is a low limit. These voltages are changed to A/D counts by the A/D CONVERTER in the ELECTROMETER. The voltages measured for the sample and reference ELECTRODES on a test slide are compared with the reference and offset voltages to determine if the test reading is within the limits.

Specifications:

The 3 "REF" values should be:
 - within the range of -1500 to -1700 A/D units
 - within 6 A/D units of each other.

The 3 "OFST" values should be:
 - within the range of -50 to +50 A/D units
 - within 6 A/D units of each other.

When to Do:

- When diagnosing error codes E11, E12, E13, E14, E15, E16, E17, E18, and E19.
- After installing a replacement for any of the following parts:
 ELECTROMETER ASSEMBLY
 INTERFACE BOARD
 MOTHER BOARD in a Multi-Board unit
 MASTER BOARD in a Single-Board unit

[1] Execute option 62 and record the test time.
 Enter the number 60 for a minimum test time of 60 seconds.

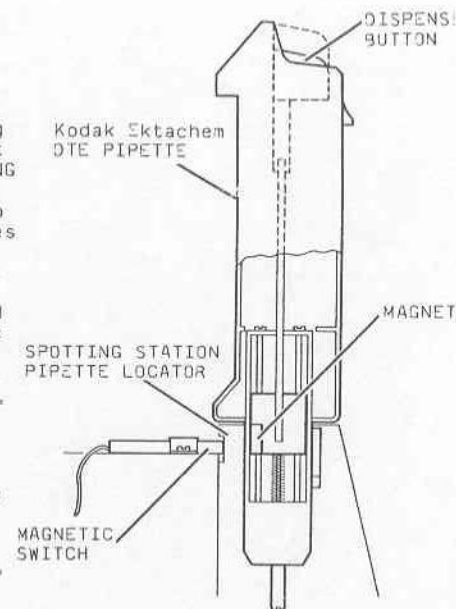
[2] Execute option 14 to obtain A/D values on the printout with the test results.

IMPORTANT

Use the Kodak Ektachem DTE PIPETTE to simulate metering and start each test. Insert the PIPETTE into the SPOTTING STATION PIPETTE LOCATOR and press the DISPENSE BUTTON to move the MAGNET that actuates the MAGNETIC SWITCH. TIPS and fluid are not necessary.

- [3] Enter the operating mode and process any 3 potentiometric slides. Use new or previously processed slides.

Processing slides is only necessary to obtain the reference and offset values. These values are produced internally in the ELECTROMETER and are not affected by the slide readings.



- [4] Check the results for "REF" and "OFST" on the printouts.

```

NA+
  0. MV
G(MV) = 0.
A/D = -1550
REF = -1621
OFST = -5
TEMP = 2945
  
```

- [5] Are the "REF" and "OFST" values within the specifications?



The test is
 successful.



The test is
 not successful.

- [6] Enter option 62 and the original test time recorded in step 1.

Kodak, Ektachem, DT60, DTE, and DTSC are trademarks.

1/88
XP3100-21

Customer Equipment Services
EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650



Printed in USA



Publication No. XP3100-10
6/88
Supersedes: XP3100-10
10/87

Kodak Ektachem DT60 ANALYZER

Parts/Removals

Section 10

PLEASE NOTE

The information contained herein is based on the experience and knowledge relating to the subject matter gained by Eastman Kodak Company prior to publication.

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.....
• CAUTION •
.....



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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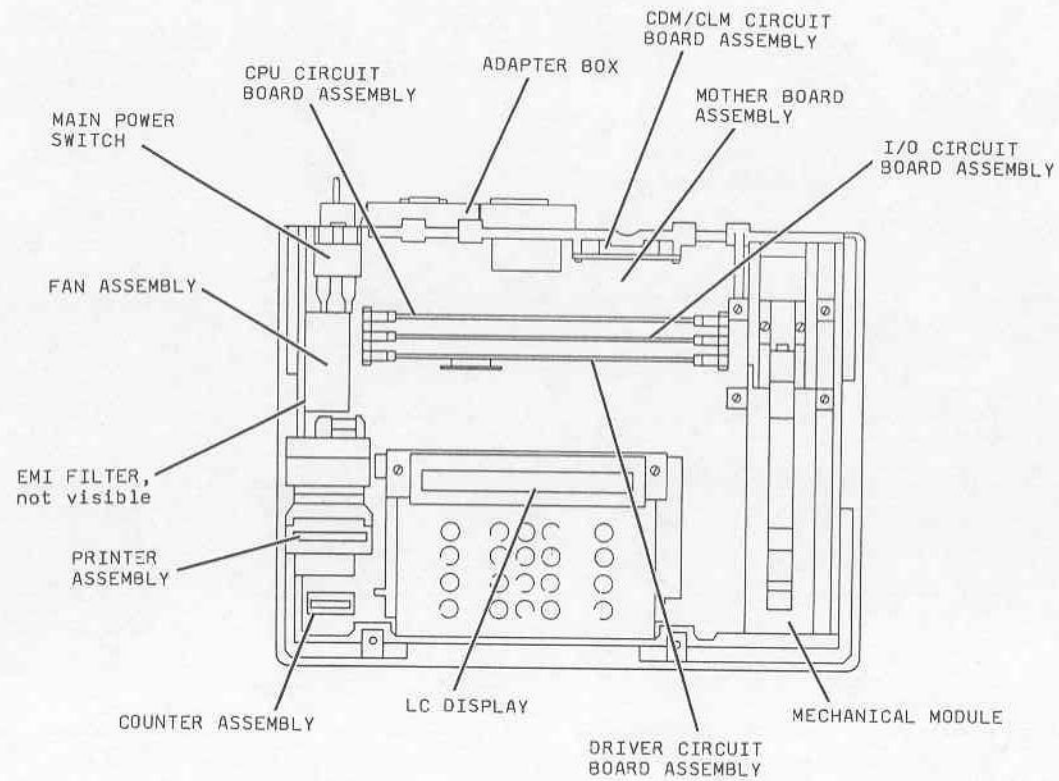
NOTE

Complete procedures are available in the Adjustments and
Special Procedures sections for the DT60 ANALYZER and the
Kodak Ektachem DTE MODULE.

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Multi-Board Configuration



Multi-board Configuration

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10-1

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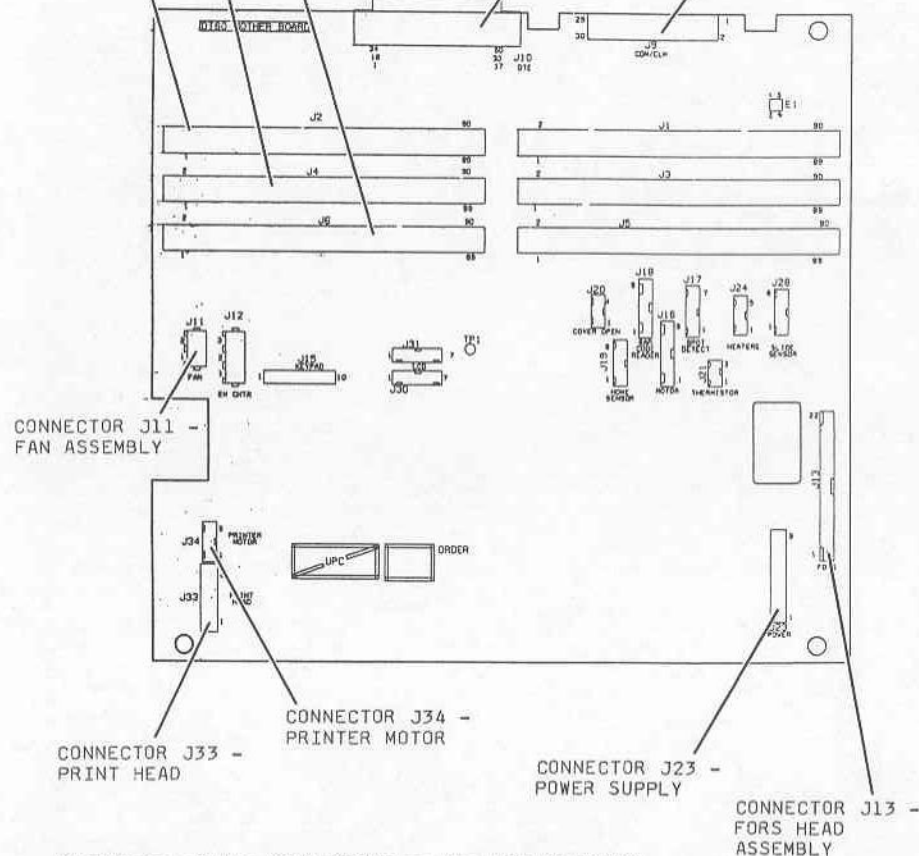
CONNECTORS J1, J2 -
Connect to J1, J2, on
CPU BOARD

CONNECTORS J3, J4 -
Connect to J1, J2, on
I/O BOARD

CONNECTORS J5, J6 -
Connect to J1, J2 on
DRIVER BOARD

CONNECTOR J10 -
DTE MODULE

CONNECTOR J9 -
Connects to J35,
CDM/CLM BOARD

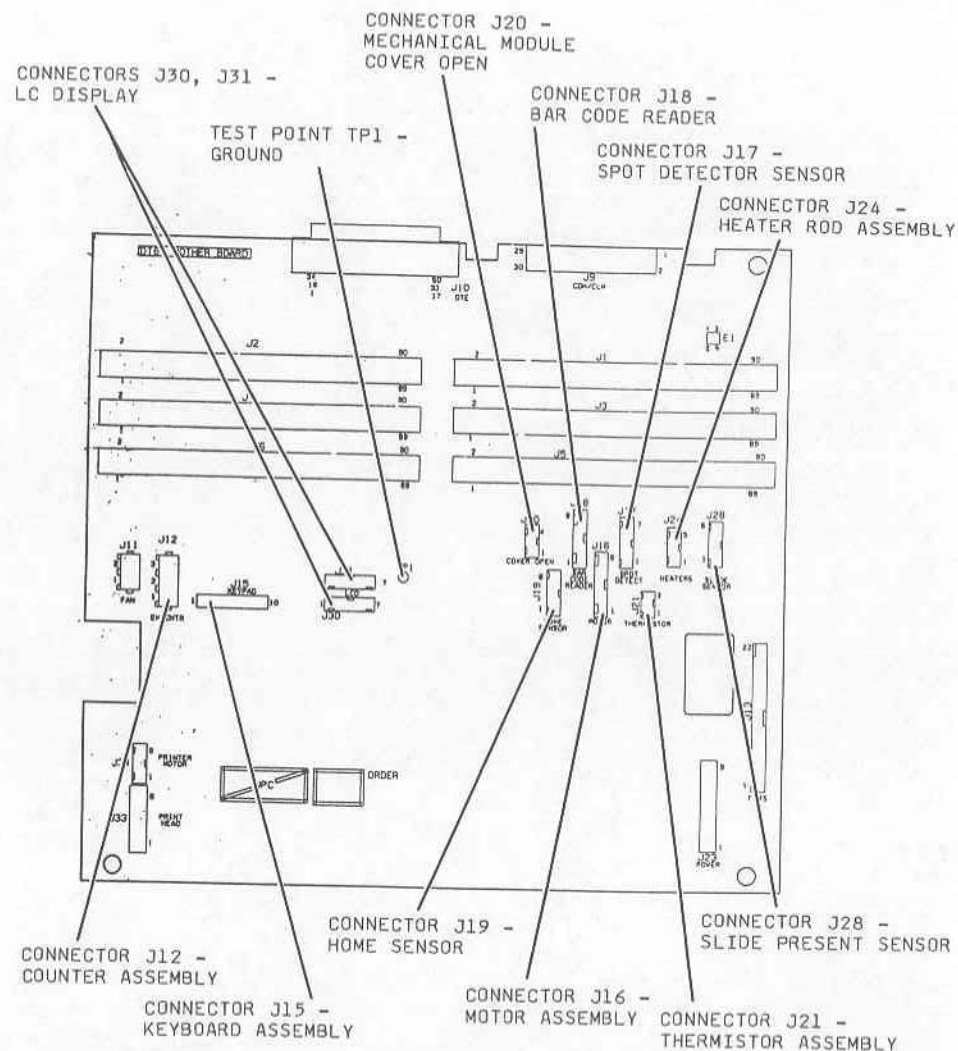


Positions of the CONNECTORS on the MOTHER BOARD -
Multi-Board Configuration

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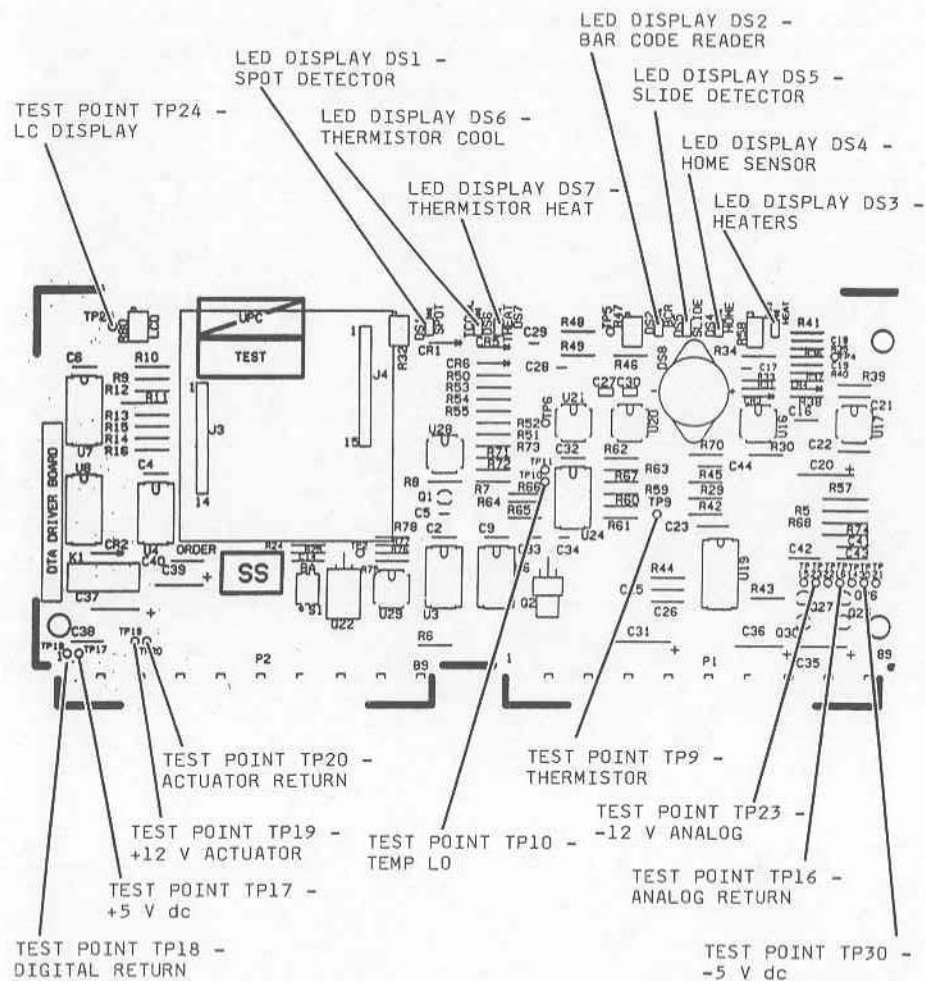


Positions of TEST POINT TP1 and the CONNECTORS on the MOTHER BOARD -
Multi-Board Configuration

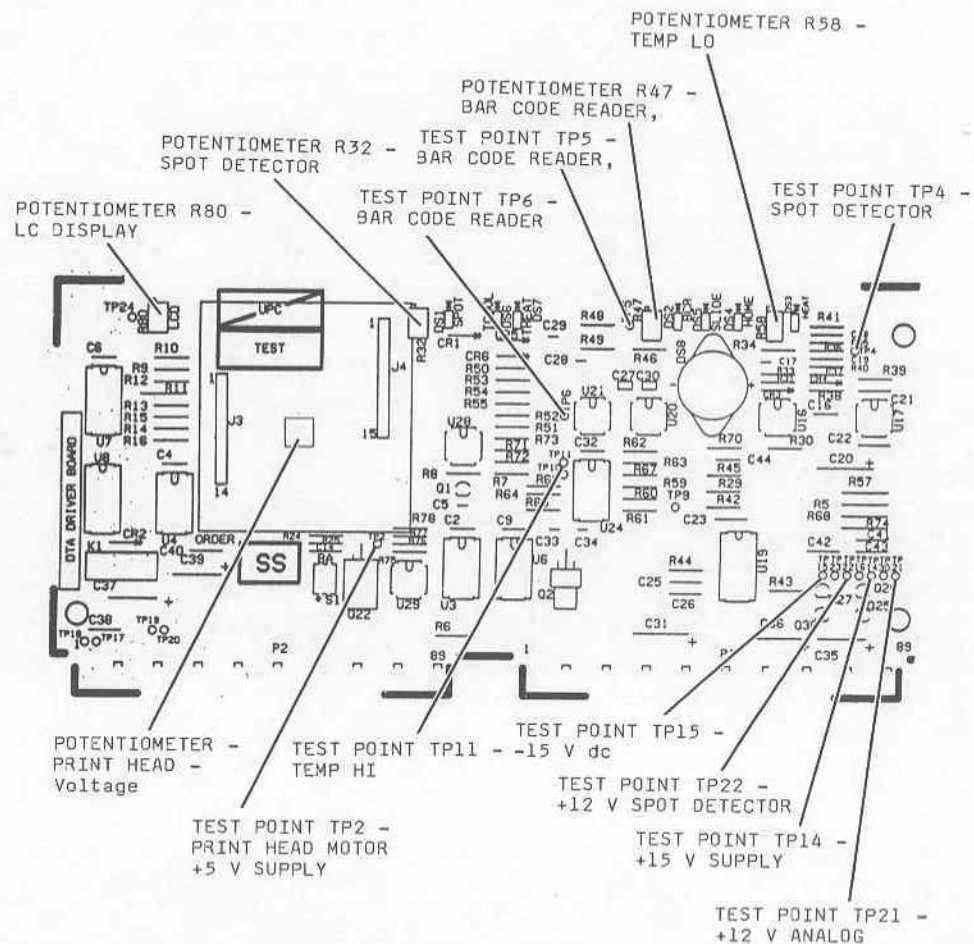
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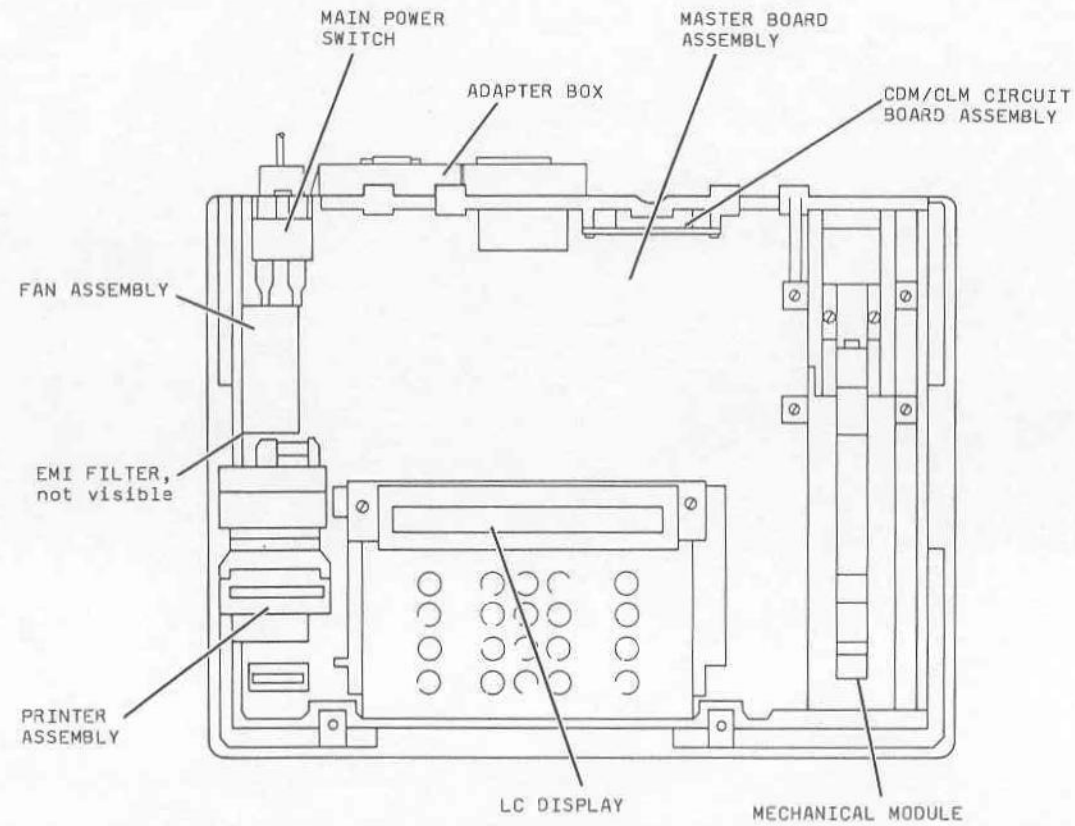


Positions of TEST POINTS and LED DISPLAYS on the DRIVER BOARD - Multi-Board Configuration



Positions of TEST POINTS and POTENTIOMETERS on the DRIVER BOARD - Multi-Board Configuration

Single-Board Configuration

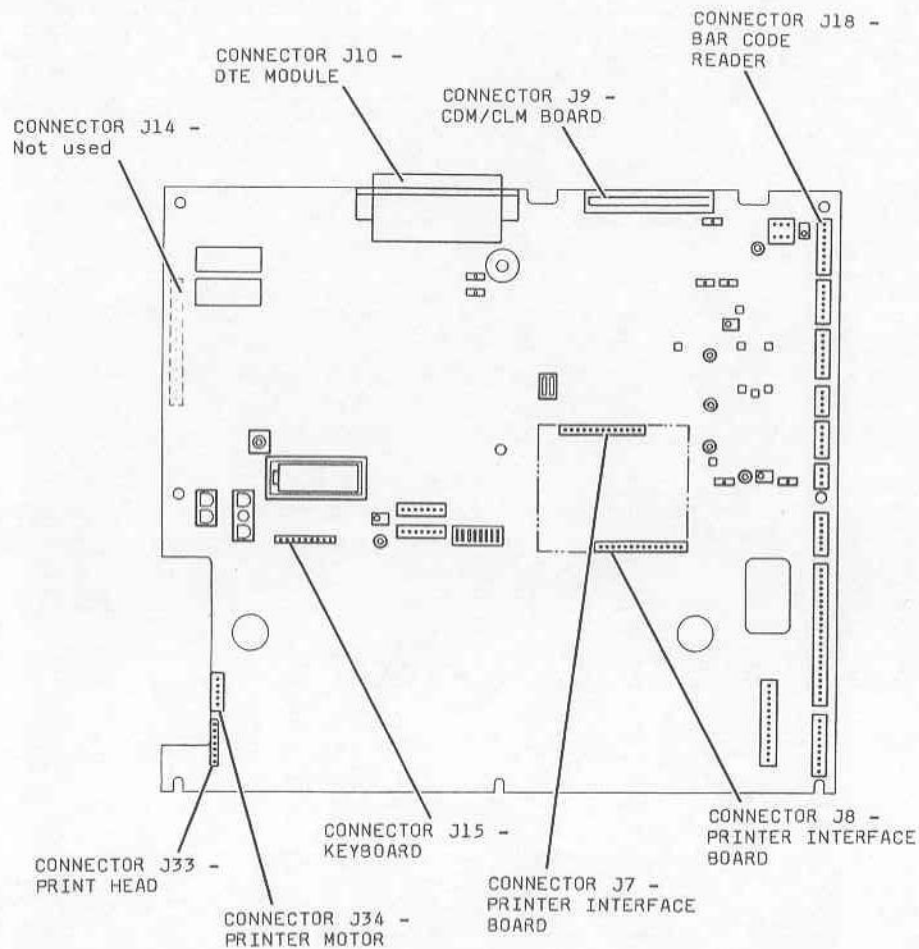


Single-board Configuration

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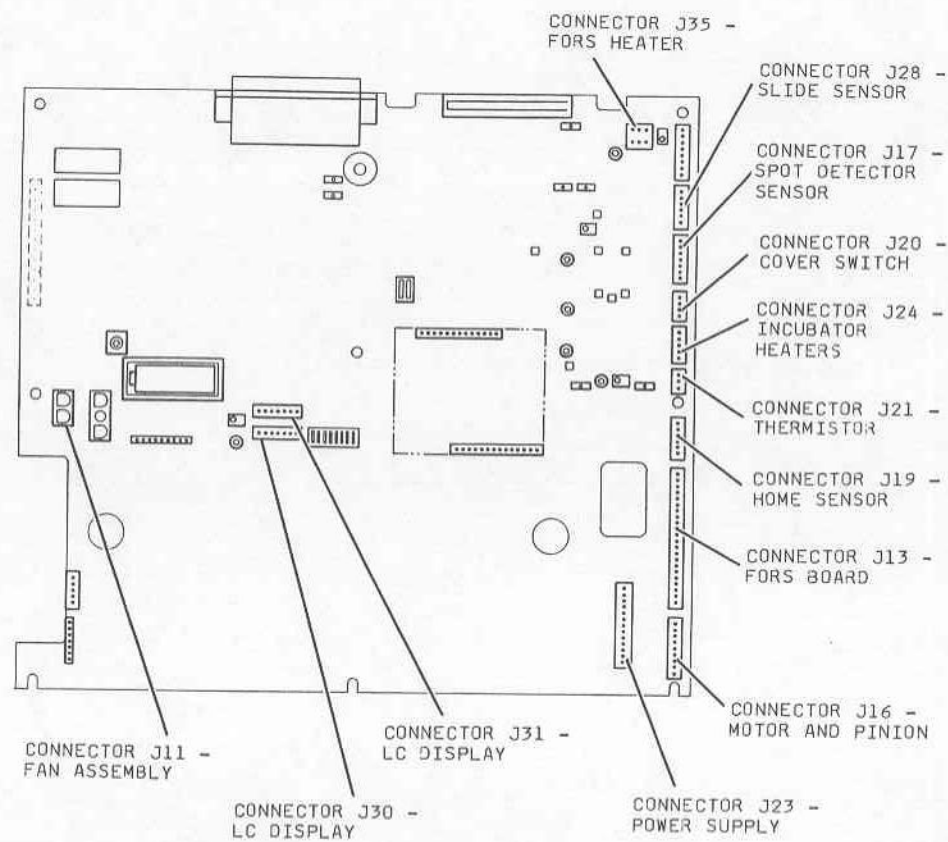


Positions of the CONNECTORS on the MASTER BOARD -
Single-board Configuration

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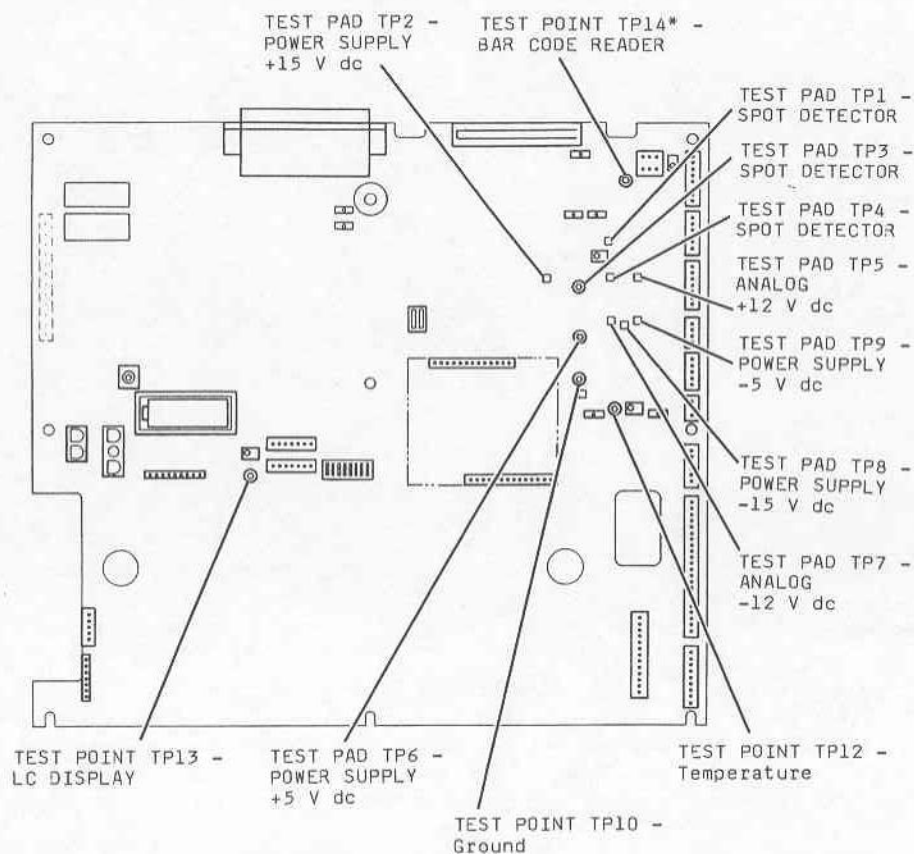


Positions of the CONNECTORS on the MASTER BOARD -
Single-board Configuration

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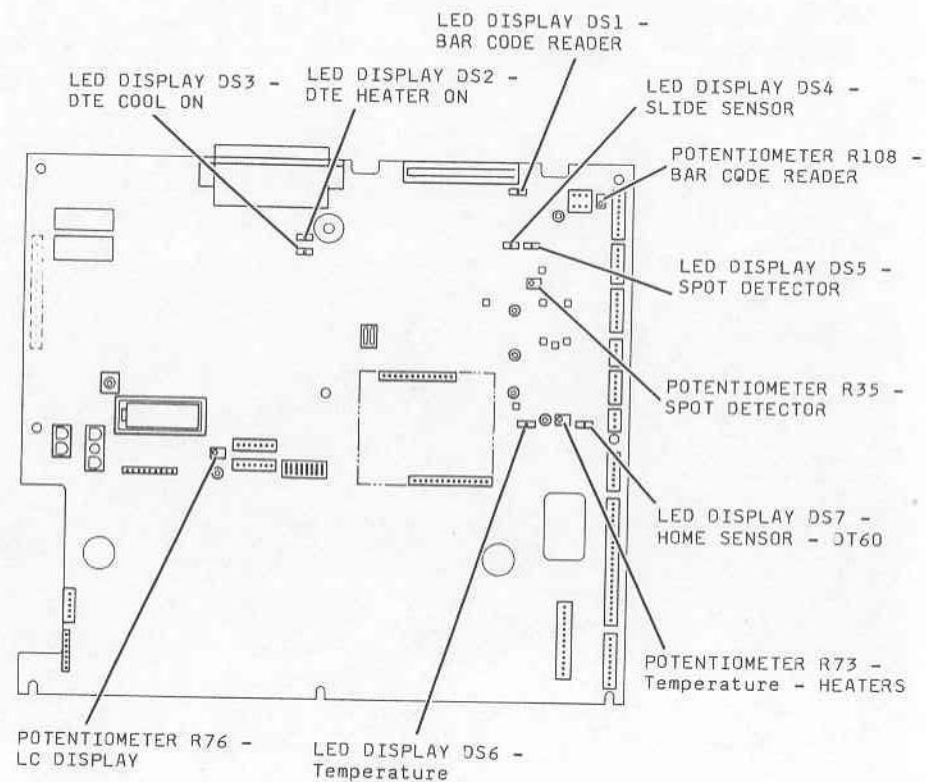
*TP14 might be a TEST PAD on some MASTER BOARDS.

Positions of TEST POINTS on the MASTER BOARD - Single-board Configuration

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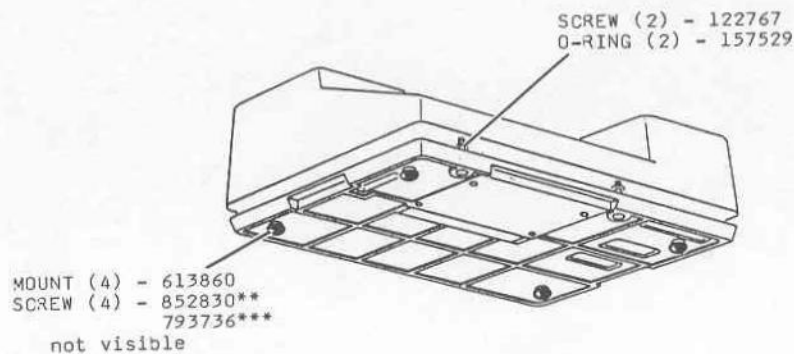
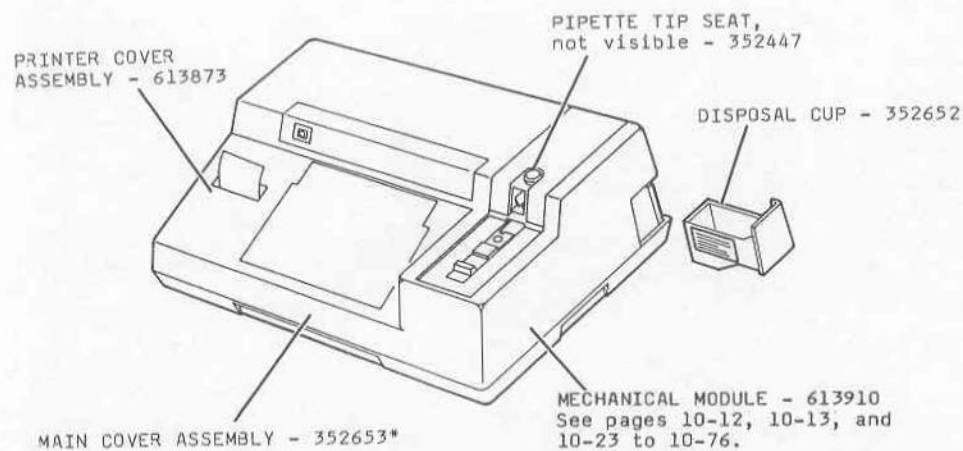
Positions of POTENTIOMETERS and LED DISPLAYS on the MASTER BOARD - Single-board Configuration

XP3100-10

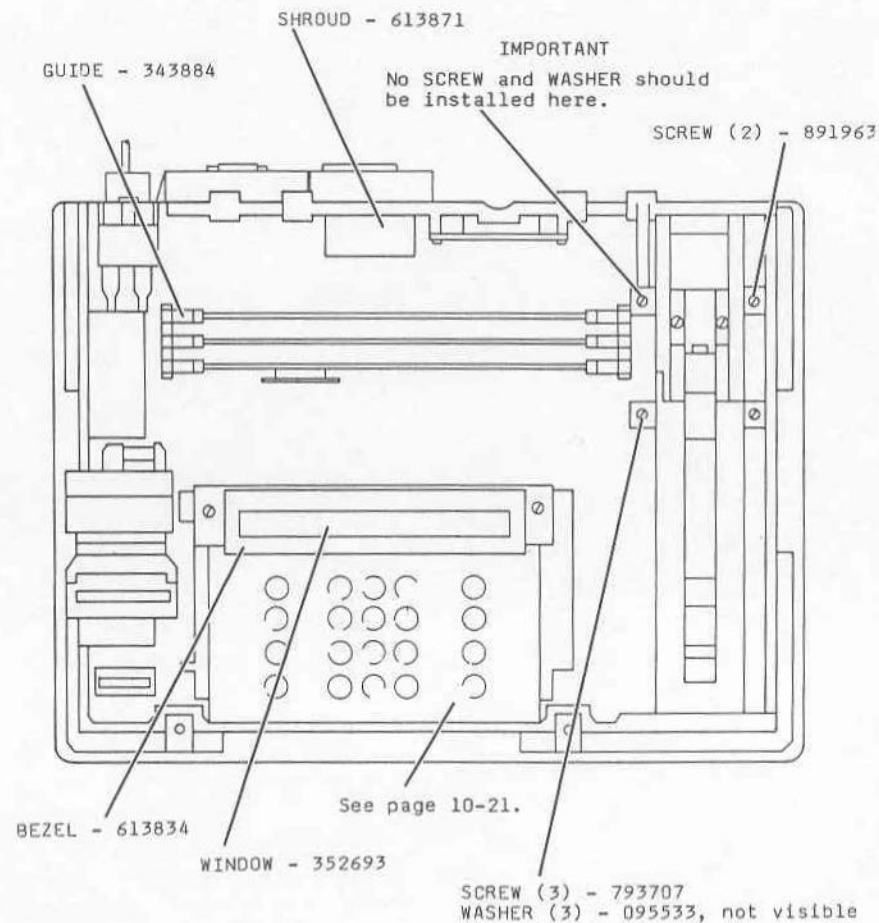
10-10

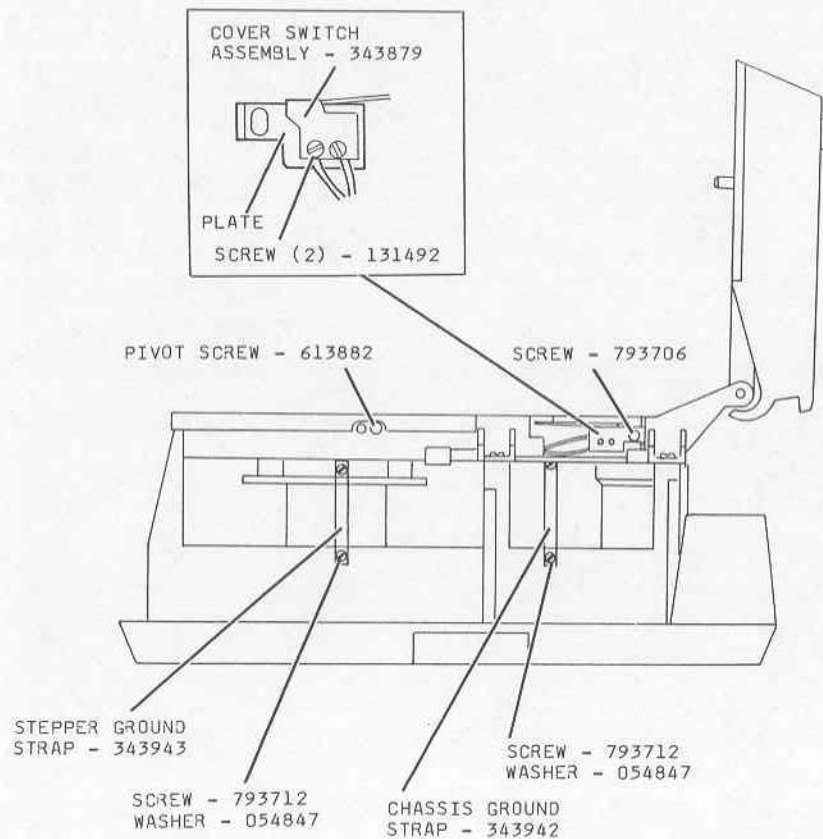
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Illustrated Parts, Removals, and Installations



- * Remove the MAIN COVER before doing any removal procedure. Install the MAIN COVER after the parts are installed.
- ** Machine screw - below serial number 60009000
- *** Self-tapping screw - serial number 60009000 and above





To remove the COVER SWITCH

Special Tools: MULTIMETER TL-3424
SEALANT TL-2390

To Remove:

- [1] Move the PIPETTE LOCATOR up.
- [2] Disconnect CONNECTOR J20 from the MOTHER BOARD or from the MASTER BOARD. See page 10-3 or 10-8.
- [3] Remove the SCREW 793706.
- [4] Remove from the PLATE:
 - 2 SCREWS 131492
 - COVER SWITCH

To install:

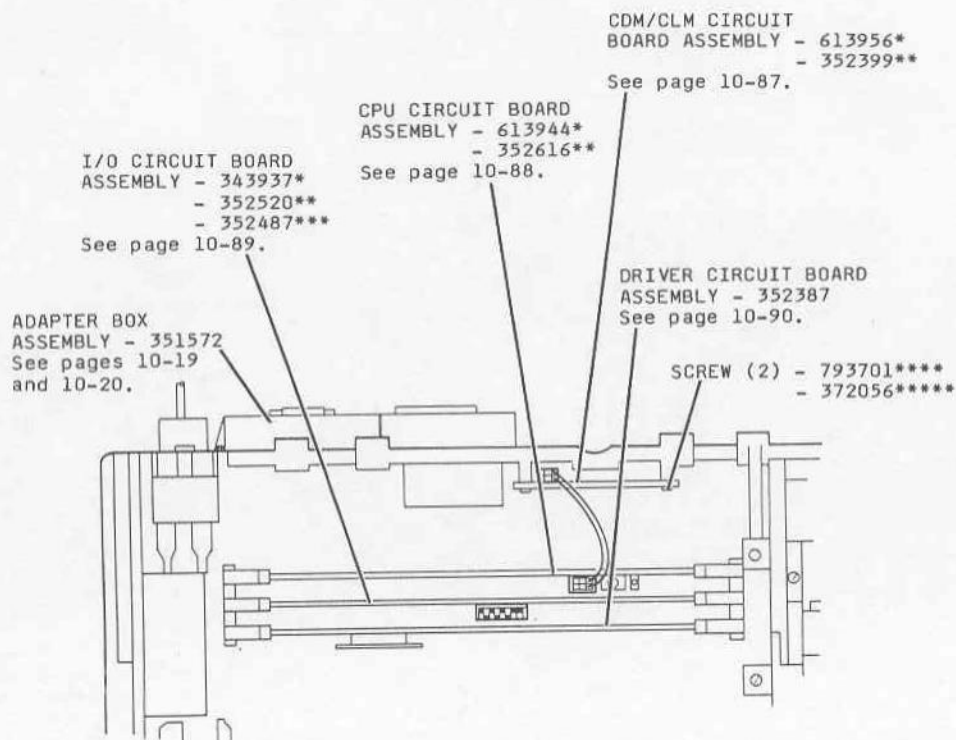
- [1] Install the new COVER SWITCH on the PLATE.
- [2] Use the SEALANT TL-2390 and install, but do not tighten, the SCREW 793706.
- [3] Move the PLATE toward the bottom of the ANALYZER, and tighten the SCREW.

In steps 4 - 6, you will adjust the position of the COVER SWITCH so that it has continuity when the PIPETTE LOCATOR is down, and no continuity when the PIPETTE LOCATOR is up.

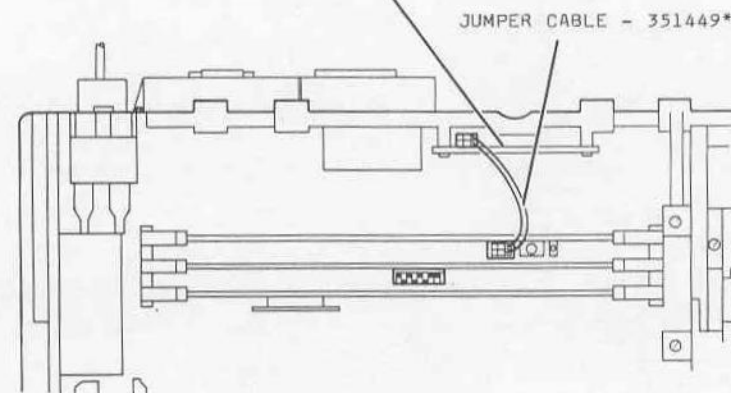
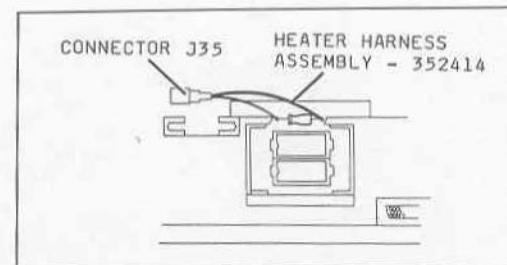
- [4] Connect the MULTIMETER TL-3424 to check the continuity of the COVER SWITCH. Observing the polarity is not necessary when you connect TL-3424.

MULTIMETER TL-3424
CONNECTOR J20

- [5] Move the PIPETTE LOCATOR up and down to check the continuity of the COVER SWITCH.
- [6] If necessary, move the PLATE a minimum distance and check the continuity again.
- [7] When the continuity is correct, tighten the SCREW 793706.
- [8] Disconnect the MULTIMETER TL-3424.
- [9] Connect CONNECTOR J20.
- [10] Return the DT60 ANALYZER to normal operating condition.



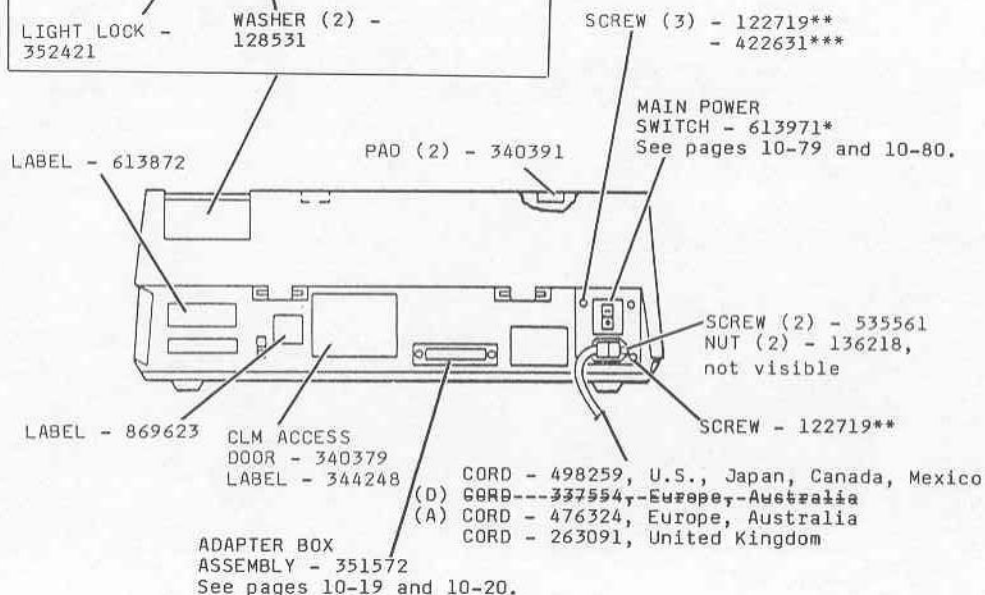
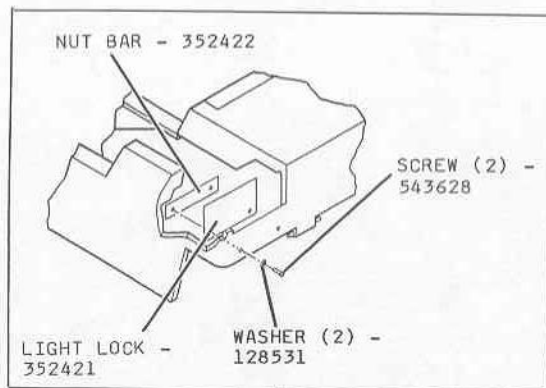
- * Version 9.0 software.
- ** Version 10.7 software.
- *** Version 11.0 software.
- **** Machine screw - Serial Nos. below 60009000
- ***** Self-tapping screw - Serial Nos. 60009000 and above



* For Multi-Board Configuration: JUMPER CABLE 351449 should be installed only in DT60 ANALYZERS with the old style MOTHER BOARD. The old style MOTHER BOARDS do not have CONNECTOR J35.

In DT60 ANALYZERS with the new style MOTHER BOARD, do not install CABLE 351449. CONNECTOR P35 on the FORS WEIGHT HEATER should be connected directly to CONNECTOR J35 on the CDM/CLM CIRCUIT BOARD ASSEMBLY.

For Single-Board Configuration: CABLE 351449 is not necessary in Single-Board Configuration DT60 ANALYZERS. CONNECTOR P35 on the FORS WEIGHT HEATER can be connected directly either to CONNECTOR J35 on the CDM/CLM CIRCUIT BOARD ASSEMBLY, or to CONNECTOR J35 on the MASTER BOARD.



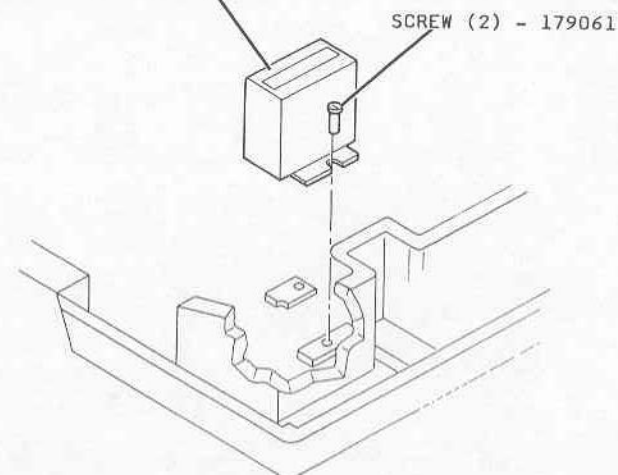
***IMPORTANT**

Move the MAIN POWER SWITCH to the "0" position before doing any removal procedure.
Move the MAIN POWER SWITCH to the "1" position after all the parts are installed.

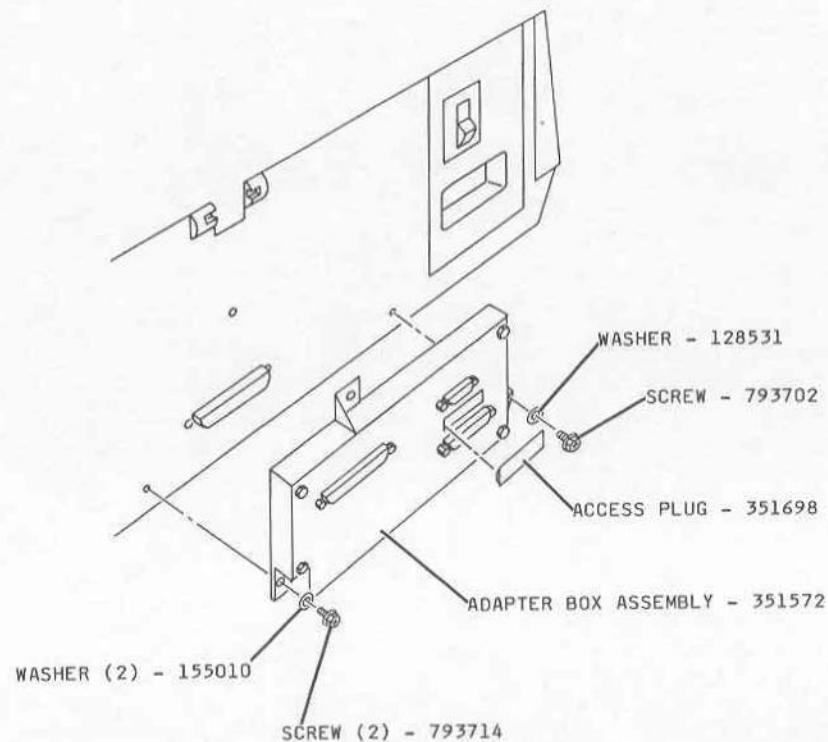
** Machine screw - Serial Nos. below 60009000

*** Self-tapping fasteners - Serial Nos. 60009000 and above

COUNTER-ASSEMBLY - 613962*



*Not installed in DT60 ANALYZERS
assembled at KAD after 2/16/87.
Not available from PS stock.



To install the ADAPTER BOX ASSEMBLY, Part No. 351572

Special Tools: SERIAL LOOPBACK CONNECTOR TL-3225
DUAL SOCKET ADAPTER TL-3603

IMPORTANT

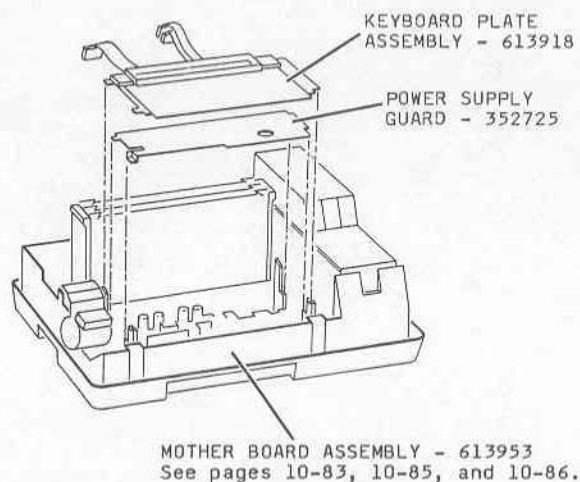
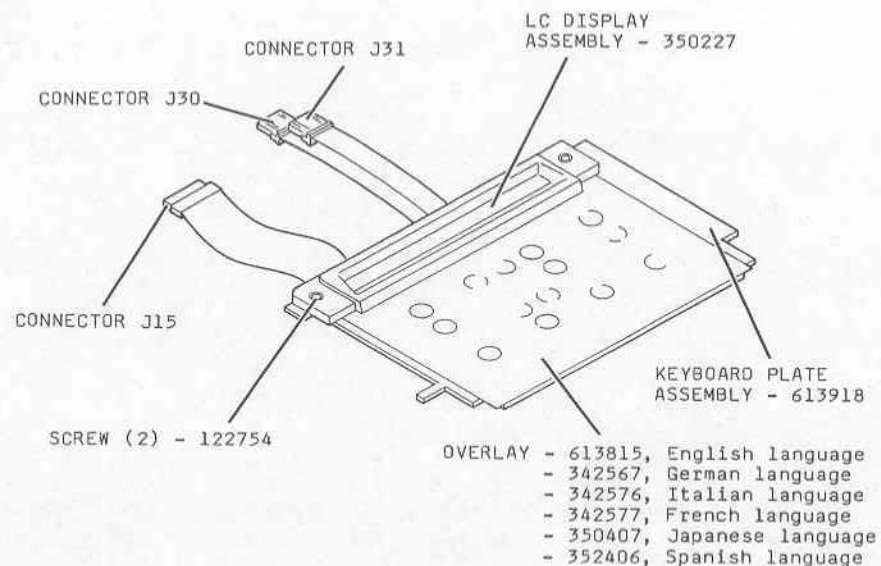
Modification No. 5 must be installed on the DT60 ANALYZER before the ADAPTER BOX ASSEMBLY is installed.

- [1] Move the MAIN POWER SWITCH on the DT60 ANALYZER to the "0" position.

.....
• CAUTION •
.....

Possible damage from electrostatic discharge.

- [2] Remove:
- MAIN COVER
 - CPU BOARD
 - I/O BOARD
 - DRIVER BOARD
- [3] Remove the package materials from the new ADAPTER BOX ASSEMBLY, part No. 351572.
- [4] If a Kodak Ektachem DTE MODULE is installed, disconnect the CABLE from the DT60 ANALYZER.
- [5] Remove and discard the 2 SCREWS.
- [6] Install:
- ADAPTER BOX ASSEMBLY 351572
 - 2 WASHERS 793714
 - 2 SCREWS 155010
 - WASHER 128531
 - SCREW 793702
- [7] Install:
- CPU BOARD
 - I/O BOARD
 - DRIVER BOARD
 - MAIN COVER
- [8] To operate the Internal Loopback Test, execute Option 21.
See the Options section for the DT60 ANALYZER.
- [9] To operate the Serial Data Loopback Test, execute Option 20.
See the Options section for the DT60 ANALYZER.



To remove the LC DISPLAY

.....
 • CAUTION •

Possible damage from electrostatic discharge.

- [1] Disconnect CONNECTORS J30 and J31 from the MOTHER BOARD or from the MASTER BOARD. See page 10-3 or 10-8.
- [2] Remove the 2 SCREWS 122754 and the LC DISPLAY.

To Install:

- [1] Install the parts in the reversed order.
- [2] Move the MAIN POWER SWITCH to the "1" position.
- [3] If the contrast of the characters on the LC DISPLAY is not easy to see, do the adjustment for the LC DISPLAY.
- [4] Return the DT60 ANALYZER to normal operating condition.

Adjustment specifications for the LC DISPLAY

The characters on the LC DISPLAY should have optimum contrast and be easy to read.

POTENTIOMETER:

R80 on the DRIVER BOARD for the Multi-Board Configuration

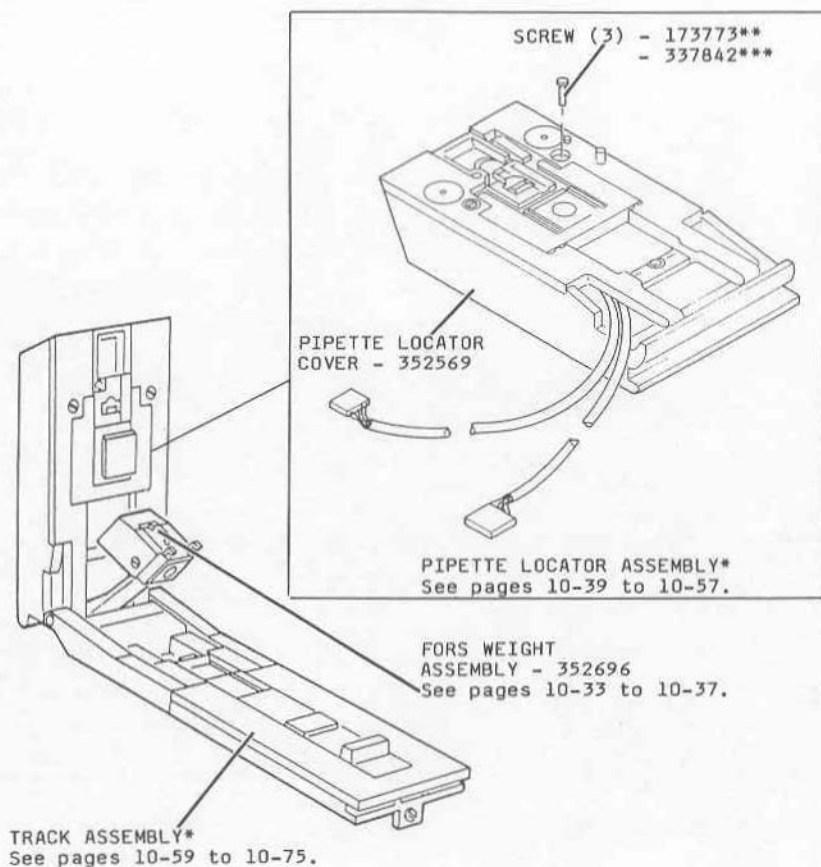
R76 on the MASTER BOARD for the Single-Board Configuration

To remove the KEYBOARD OVERLAY

- [1] Remove the LC DISPLAY.
- [2] Remove the KEYBOARD OVERLAY from the KEYBOARD PLATE.

To Install:

- [1] Install the parts in the reversed order.
- [2] Return the DT60 ANALYZER to normal operating condition.



* Not available as a separate item from PS.
 ** Serial number 60002075 and below.
 *** Serial number 60002076 and above.

MECHANICAL MODULE ASSEMBLY*
 Includes: PIPETTE LOCATOR ASSEMBLY*
 FORS WEIGHT ASSEMBLY 352696
 TRACK ASSEMBLY*

To install the PIPETTE LOCATOR COVER:

.....
 • CAUTION •

When you install the 3 SCREWS 173773 or 337842, do not overtighten the SCREWS excessively. Excessive tightening the 3 SCREWS might cause damage to the COVER.

- [1] Install the PIPETTE LOCATOR COVER and the 3 SCREWS 173773 or 337842.

- [2] Check that the adjustment for the height of the TIP SEAT is correct. See the Adjustments and Special Procedures section.

IMPORTANT

Adjusting the height of the TIP SEAT might cause changes in the results for some colorimetric chemistries that are sensitive to differences in metering conditions.

- [3] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them:

HDLC
 TP
 TRIG

If any results are not within the limits for the DT60 ANALYZER, or if any values for the CONTROLS are changed, a full wet calibration should be done for those chemistries.

- [4] Return the DT60 ANALYZER to the normal operating condition.

Adjustment Specifications for the Height of the TIP SEAT

The height of the TIP SEAT is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Special Tools and Materials

TIP HEIGHT ADJUSTMENT GAUGE
 TL-3446

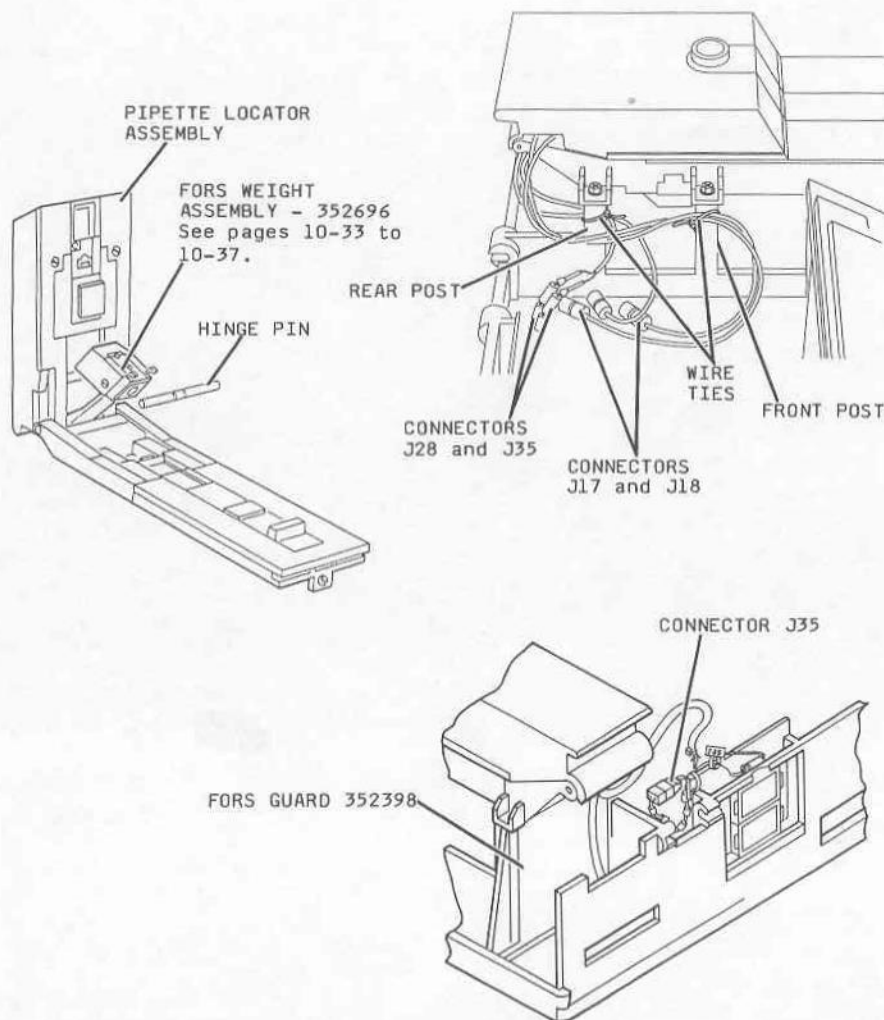
PIPETTE ADJUSTMENT WRENCH
 TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



To remove the PIPETTE LOCATOR and the FORS WEIGHT ASSEMBLY

- [1] Move the MAIN POWER SWITCH to the "0" position.

.....
• CAUTION •
.....

Possible damage from electrostatic discharge.

- [2] Remove:

- DISPOSAL CUP, see page 10-11
- MAIN COVER, see page 10-11
- FORS GUARD, see page 10-11
- KEYBOARD PLATE ASSEMBLY, see page 10-21

- [3] Disconnect, from the MOTHER BOARD or from the MASTER BOARD:

- CONNECTORS J17 and J18 from the PIPETTE LOCATOR, or
- CONNECTOR J28 from the FORS WEIGHT ASSEMBLY.

See pages 10-7 and 10-8, or page 10-3.

- [4] Cut and remove the WIRE TIES as necessary.

- [5] If the FORS WEIGHT ASSEMBLY will be removed, disconnect CONNECTOR J35 for the FORS WEIGHT HEATER.

- [6] To remove the PIPETTE LOCATOR and the FORS WEIGHT ASSEMBLY 352696, do:

- Hold the PIPETTE LOCATOR and the FORS WEIGHT ASSEMBLY to keep them from falling
- Remove the HINGE PIN.

To Install the FORS WEIGHT ASSEMBLY and the PIPETTE LOCATOR

- [1] Install:

- FORS WEIGHT ASSEMBLY
- PIPETTE LOCATOR
- HINGE PIN

- [2] Place the 2 wires from the FORS WEIGHT ASSEMBLY in the position behind the REAR POST. See the figure on page 10-25.

- [3] Install, but do not tighten, a WIRE TIE around the REAR POST and the wires.

IMPORTANT

The PIPETTE LOCATOR COVER must be installed before you do step 4. See page 10-24.

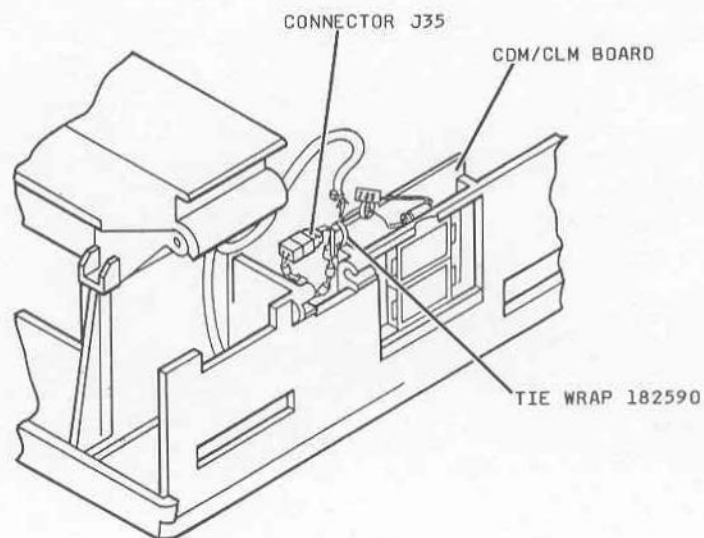
- [4] Move the PIPETTE LOCATOR and the FORS WEIGHT to the up position.

- [5] With the FORS WEIGHT in the up position, adjust the length of the wires between the FORS WEIGHT and the REAR POST so that the wire loop is not excessively large. Tighten the WIRE TIE.

- [6] Place the 2 wires from the PIPETTE LOCATOR in the position on the outside of the FRONT POST. See the figure.

- [7] Install, but do not tighten, a WIRE TIE around the FRONT POST and the wires.

- [8] With the PIPETTE LOCATOR in the up position, adjust the length of the wires between the PIPETTE LOCATOR and the FRONT POST so that the wire loop is not excessively large. Tighten the WIRE TIE.



[9] Check:

- the PIPETTE LOCATOR can be lifted and moved down freely.
- the FORS WEIGHT can be lifted and moved down freely with no obstructions.
- the FORS WEIGHT can remain in the up position when the PIPETTE LOCATOR is up.

NOTE

If the wires are too short, the FORS WEIGHT will not remain in the up position.

If the wires are too long the loop that is made when the FORS WEIGHT is down might obstruct the movement of the FORS WEIGHT.

[10] Connect CONNECTOR J35.

[11] Use a WIRE TIE to attach CONNECTOR J35 to the CDM/CLM BOARD.

[12] Check that the FORS WEIGHT can be lifted fully. If necessary, move or adjust the length of the wire to allow the free movement of the FORS WEIGHT.

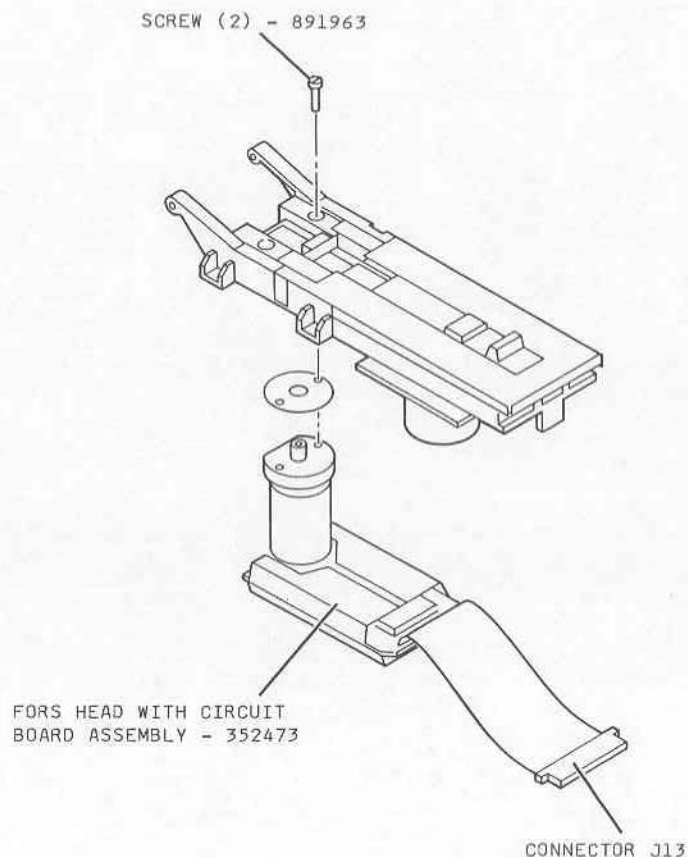
[13] Connect CONNECTORS J17, J18, and J28 to the MOTHER BOARD or the MASTER BOARD.

[14] Install:

- FORS GUARD
- KEYBOARD
- MAIN COVER
- DISPOSAL CUP

[15] Move the MAIN POWER SWITCH to the "1" position.

[16] Return the DT60 ANALYZER to the normal operating condition.



To remove the FORS ASSEMBLY

[1] Remove:

- DISPOSAL CUP, see page 10-11
- FORS GUARD, see page 10-25
- 3 SCREWS 793707, see page 10-59
- 2 GROUND STRAP SCREWS 793712, see page 10-59
- 2 WASHERS 054847, see page 10-59

[2] Disconnect CONNECTOR J13 from the MOTHER BOARD or from the MASTER BOARD. See page 10-2 or 10-8.

[3] Lift the PIPETTE LOCATOR.

.....
 • CAUTION •

Do not allow the FORS ASSEMBLY to fall from the bottom of the MECHANICAL MODULE.

[4] Hold the FORS ASSEMBLY and loosen the 2 SCREWS 891863.

[5] Lift the MECHANICAL MODULE and remove the FORS ASSEMBLY.

[3] - If the existing FORS ASSEMBLY was removed and installed again, process Kodak Ektachem CONTROLS for all colorimetric chemistries used by the customer. If necessary, calibrate the DT60 ANALYZER for any chemistries that do not provide correct results.

- If a new FORS ASSEMBLY was installed, do the Correction Factors procedure. See the Adjustments and Special Procedures section for the DT60 ANALYZER.

IMPORTANT

If you revise the correction factors for any LED, a full wet calibration must be done for all colorimetric chemistries that use the LED or LEDs that have revised correction factors.

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.

[4] Return the DT60 ANALYZER to normal operating condition.

To install

[1] Install the parts in the reversed order.

[2] Check that the adjustment for the FORS ASSEMBLY is correct. See the Adjustments and Special Procedures section.

NOTE

See the following page for the adjustment and special procedure specifications.

Adjustment specification for the FORS ASSEMBLY

For White Reference

Check for A/D values of 3650 to 3850. If the correct values are not obtained, adjust the A/D values to 3690 to 3810. Each group of 5 values must be within 10 units of each other.

For Black Reference

Check or adjust the A/D values to -100 to +100. Each group of 5 values must be within 10 units of each other.

Special Tools

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424

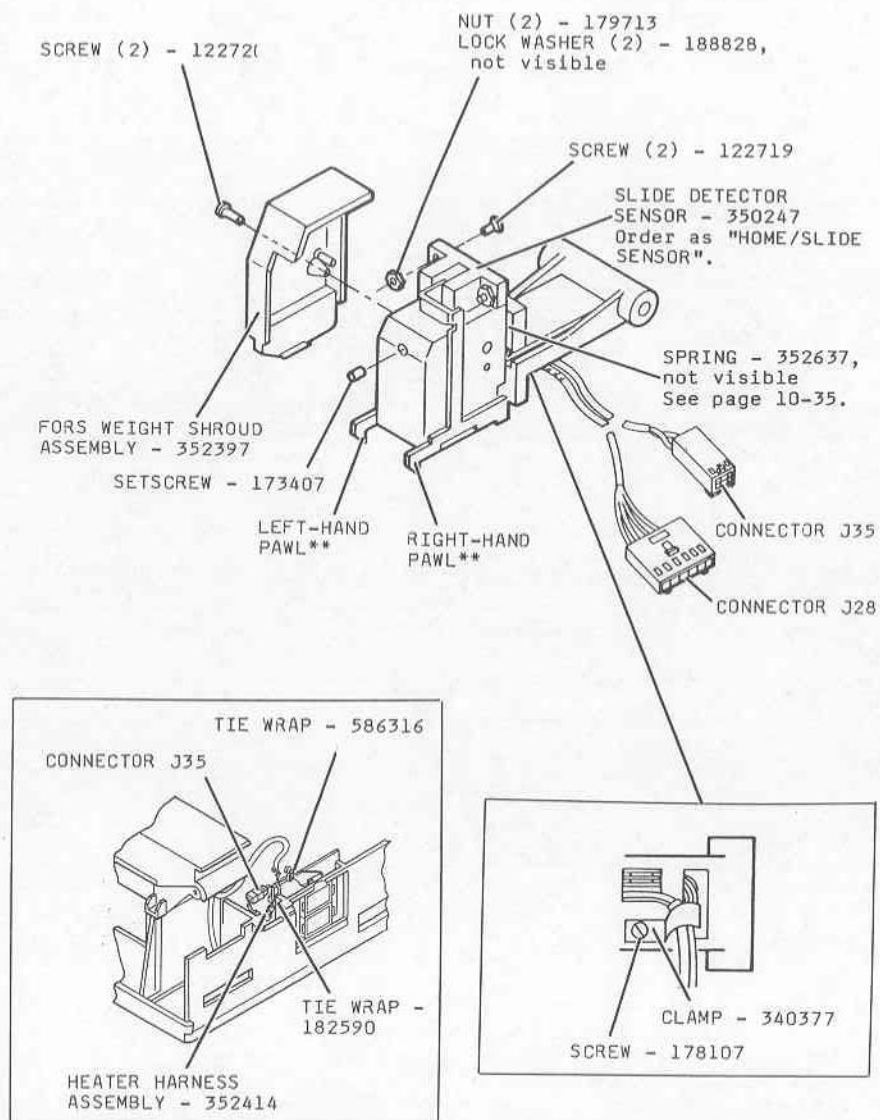
TEST POINTS on the FORS BOARD

TP6 for voltage through the LEDs
TP4 for control current
TP8 for gain
TP12 for ground

POTENTIOMETERS on the FORS ASSEMBLY

R25 to set null*
R26 to set gain of the AMPLIFIER
R29 to set the red LED
R30 to set the yellow LED
R31 to set the green LED

* Not all FORS ASSEMBLIES have R25.
See the adjustment procedure for additional information.



FORS WEIGHT ASSEMBLY - 352696*

* Includes all the parts on pages 10-33 and 10-35.

To remove the SLIDE DETECTOR SENSOR

- [1] Move the PIPETTE LOCATOR and the FORS WEIGHT ASSEMBLY backward.
- [2] Disconnect CONNECTOR J28 from the MOTHER BOARD or from the MASTER BOARD. See page 10-3 or 10-8.
- [3] Loosen the SCREW 178107 from the bottom of the FORS WEIGHT and move the CLAMP 340377.

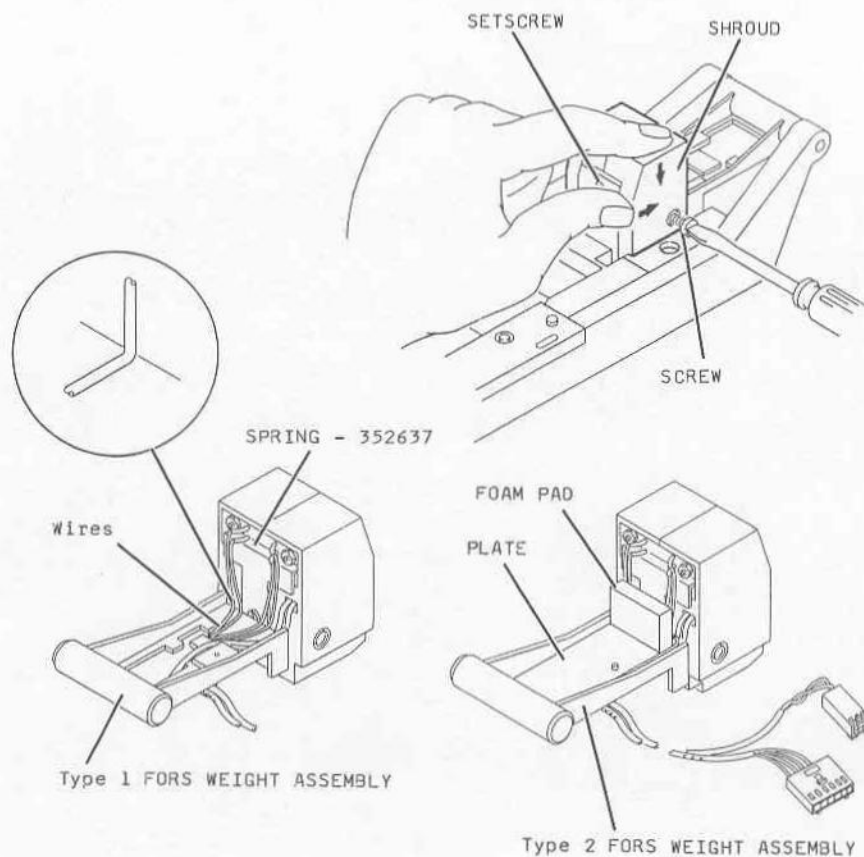
IMPORTANT

Observe the positions of the wires connected to the SLIDE DETECTOR SENSOR. The wires must be in the same positions when you install the SENSOR.

[4] Remove:

- 2 SCREWS 122720
- 2 FORS WEIGHT SHROUDS
- RIGHT-HAND PAWL**
- LEFT-HAND PAWL**
- 2 NUTS 179713
- 2 SCREWS 122719
- 2 LOCK WASHERS 188828
- SLIDE DETECTOR SENSOR

** The PAWLS are not available as separate items from PS. If a replacement is necessary for either PAWL, install a replacement for the FORS WEIGHT ASSEMBLY.



To install:

- [1] Install the parts in the reversed order.

IMPORTANT

The FORS WEIGHT SHROUDS must be installed in the correct position to prevent binds in the PAWLS.

- [2] Do the following to install the SHROUDS:

- Install the SHROUDS.
- Install, but do not tighten, the 2 SCREWS 122720.
- Lower the FORS WEIGHT ASSEMBLY.
- Push down and back on the right SHROUD and tighten the SCREW.
- Push down and back on the left SHROUD and tighten the SCREW.
- Lift the FORS WEIGHT so the PAWLS are a minimum distance above the Spotting Station.
- To check that the PAWL has no binds, manually lift each PAWL separately and allow it to fall. Do this step 3 or 4 times.

IMPORTANT

- If the FOAM PAD has been removed from the PLATE of a Type 2 FORS WEIGHT ASSEMBLY, you must install a new FORS WEIGHT ASSEMBLY.
- If the FORS WEIGHT is Type 1, with no PLATE and FOAM PAD, check that the wires from the back of the FORS WEIGHT are in the correct positions. See the illustration on page 10-29.
- Do not install a PLATE and FOAM PAD on a Type 1 FORS WEIGHT.

- [3] Check that the following adjustments are correct. See the Adjustments and Special Procedures section.

Adjustments
SLIDE DETECTOR SENSOR
INCUBATOR - Temperature

- [4] Do the checkout procedure for the FORS WEIGHT ASSEMBLY. See the Adjustments and Special Procedures section.

IMPORTANT

Adjusting the temperature of the INCUBATOR might cause changed test results for some colorimetric chemistries that are sensitive to the temperature during the time the slide is in the INCUBATOR.

- [5] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them:

AMYL
BUN
CREA
Hb
NH₃

If the results for any of these chemistries indicate changed values for the control fluids, a full wet calibration should be done.

- [6] Return the DT60 ANALYZER to normal operating condition.

Adjustment specification for the SLIDE DETECTOR SENSOR

The specification cannot be measured without doing the adjustment procedure. With a slide under the PAWLS, rotate the SETSCREW until the "SLIDE" LED or DS4 LED first energizes. Then rotate the SETSCREW an additional 1.5 rotations counterclockwise.

Adjustment specification for the temperature of the INCUBATOR

The calculated average of 3 high and 3 low temperatures measured at the Spotting Station must be 36.7 to 37.3°C (98 to 99°F).

POTENTIOMETER:

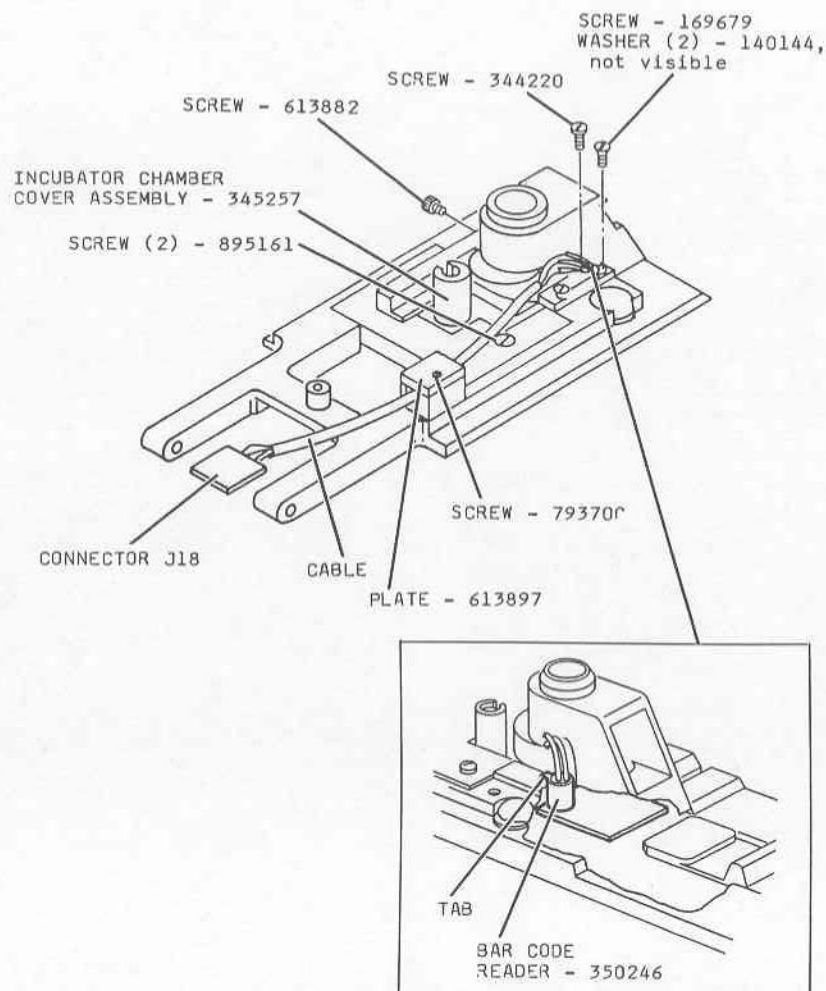
Multi-board configuration: R58 on the DRIVER BOARD
Single-board configuration: R73 on the MASTER BOARD

Specifications for the FORS WEIGHT HEATER:

- The resistance across the 2 PINS on the disconnected CONNECTOR P35 should be approximately 36.0 to 37.0 ohms.
- The voltage measured at CONNECTOR P35 and at C3 on the CDM/CLM BOARD should be +4.6 to +5.4 V dc.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Includes all the parts on pages 10-39, 10-43, 10-47, 10-51, and 10-55. Not available as a separate item from PS.

PIPETTE LOCATOR ASSEMBLY*

To remove the BAR CODE READER

- [1] Remove the PIPETTE LOCATOR COVER. See pages 10-23 and 10-24.
- [2] Loosen the SCREW 344220.
- [3] Pull the BAR CODE READER up.
- [4] Remove:
 - SCREW 793700
 - PLATE 613897
 - CABLE
- [5] Disconnect CONNECTOR J18 from the MOTHER BOARD or from the MASTER BOARD. See page 10-3 or 10-7.

To install

NOTE

The TAB on the BAR CODE READER must be toward either the left side or the back of the ANALYZER.

Check that the BAR CODE READER is fully seated in the hole.

- [1] Install the parts, except the PIPETTE LOCATOR COVER, in the reversed order.
- [2] Check that the adjustment for the focus and the voltage of the BAR CODE READER is correct. See the Adjustments and Special Procedures section.

- [3] Install the PIPETTE LOCATOR COVER. See page 10-24.
- [4] Check that the adjustment for the height of the TIP SEAT is correct. If necessary, see the Adjustments and Special Procedures section

IMPORTANT

Adjusting the height of the TIP SEAT might cause changes in the results for some colorimetric chemistries that are sensitive to differences in metering conditions.

- [5] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them:

HDLC
TP
TRIG

If any results are not within the limits for the DT60 ANALYZER, or if any values for the CONTROLS are changed, a full wet calibration should be done for those chemistries.

- [6] Return the DT60 ANALYZER to the normal operating condition.

NOTE

See the following page for adjustment specifications.

Adjustment specification for the voltage of the BAR CODE READER - Multi-Board Configuration

Insert the BAR CODE SLIDE TL-3482 with the white surface up.

If the TAB on the BAR CODE READER is toward the left of the ANALYZER, the voltage should be -5.25 to -5.75 V dc.

If the TAB on the BAR CODE READER is toward the back of the ANALYZER, the voltage should be -4.25 V dc to -4.75 V dc.

TEST POINTS:

MULTIMETER TL-3424	
+	-
TP5 on the DRIVER BOARD	TP1 on the MOTHER BOARD

POTENTIOMETER: R47 on the DRIVER BOARD

Adjustment specification for the voltage of the BAR CODE READER - Single-Board Configuration

Both surfaces of the BAR CODE SLIDE TL-3482 should be used.

The voltage reading for the white reflectance surface should be adjusted to approximately -10.0 V dc.

The minimum difference between the voltage readings for the black reflectance and the white reflectance must be 4.5 V or more.

The BAR CODE READER must be able to identify slides correctly inserted at fast and slow insertion speeds.

TEST POINTS:

MULTIMETER TL-3424	
+	-
TP14	TP10

POTENTIOMETER: R108 on the MASTER BOARD

Adjustment Specification for the Height of the TIP SEAT

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Special Tools and Materials:

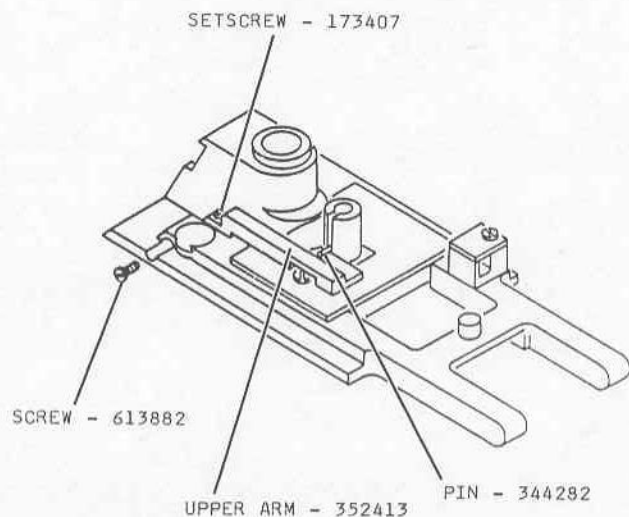
TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PIPETTE ADJUSTMENT WRENCH TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Includes all the parts on pages 10-39, 10-43, 10-47, 10-51, and 10-55. Not available as a separate item from PS.

PIPETTE LOCATOR ASSEMBLY*

To remove the UPPER ARM:

Special Tool: SEALANT TL-2390

- [1] Move the PIPETTE LOCATOR up.
- [2] Remove:
 - PIPETTE LOCATOR COVER, see pages 10-23 and 10-24
 - SCREW 613882
 - UPPER ARM

To install:

- [1] Does the new UPPER ARM have a SETSCREW?



Advance to step 5.



Advance to step 2.

- [2] Remove the SETSCREW 173407 from the original UPPER ARM.
- [3] Use SEALANT TL-2390 on the SETSCREW.
- [4] Install the SETSCREW in the new UPPER ARM.
- [5] Install the UPPER ARM and the SCREW.

NOTE

Install the UPPER ARM under the PIN.

- [6] Move the PIPETTE LOCATOR down.
- [7] Move the MAIN POWER SWITCH to the "1" position.
- [8] During initializing, check that the UPPER ARM lifts the PIN 344282 and the PIN moves up the SLOT without binding.
- [9] Move the PIPETTE LOCATOR up.
- [10] Install the PIPETTE LOCATOR COVER. See page 10-24.
- [11] Do the adjustment for the UPPER ARM. See the Adjustments and Special Procedures Section.

IMPORTANT

The adjustment of the UPPER ARM controls the position of the PRESSURE PAD. Adjusting the UPPER ARM might cause the temperature in the INCUBATOR to change. Some colorimetric chemistries are sensitive to differences in temperature during the incubation time.

- [12] Check that the adjustment for the height of the TIP SEAT is correct. If necessary, see the Adjustments and Special Procedures section.

IMPORTANT

Adjusting the height of the TIP SEAT might cause changes in the results for some colorimetric chemistries that are sensitive to differences in metering conditions.

[13] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them.

- If the UPPER ARM was adjusted: AMYL
BUN
CREA
NH₃
- If the height of the TIP SEAT was adjusted: HDLC
TP
TRIG

If the results for any of these chemistries indicate changed values for the control fluids, a full wet calibration should be done.

[14] Return the DT60 ANALYZER to the normal operating condition.

Adjustment specification for the UPPER ARM

- When Option 68 is executed for a given number of steps*, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

*NOTE

Type 1 PRESSURE PAD, 20 steps
Type 2 PRESSURE PAD, 70 steps

- With the RACKS in the home position, and a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

Adjustment Specifications for the Height of the TIP SEAT

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Special Tools and Materials:

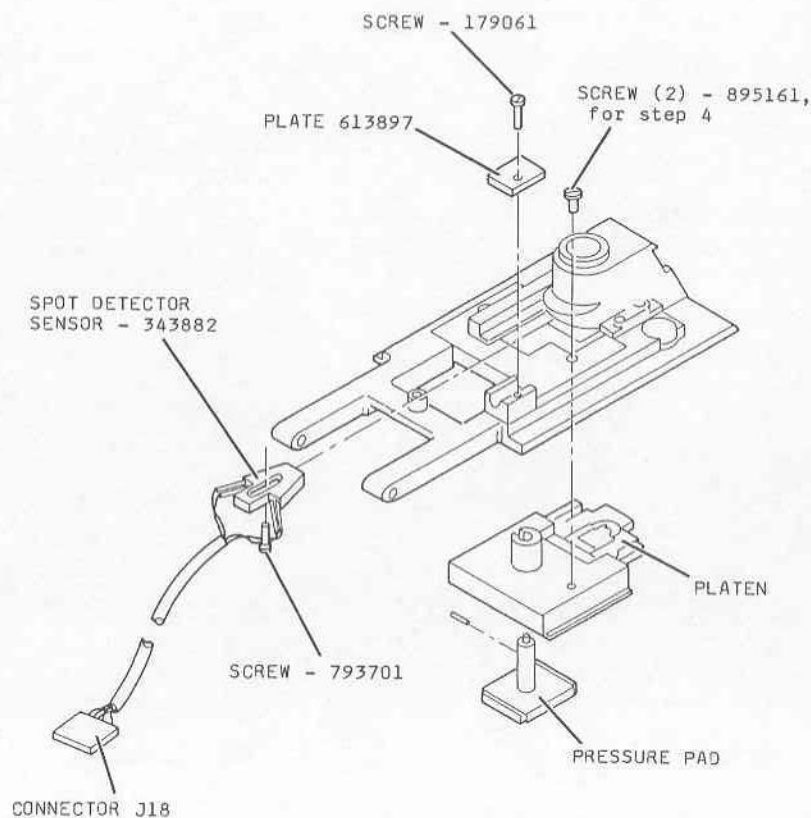
TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PIPETTE ADJUSTMENT WRENCH TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



PIPETTE LOCATOR ASSEMBLY*

* Includes all the parts on pages 10-39, 10-43, 10-47, 10-51, and 10-55. Not available as a separate item from PS.

To remove the SPOT DETECTOR SENSOR

- [1] Remove the PIPETTE LOCATOR COVER. See pages 10-23 and 10-24.
- [2] Move the PIPETTE LOCATOR down.
- [3] Loosen the SCREW 179061 and remove the PLATE 613897.

NOTE

The PRESSURE PAD and the PLATEN will fall from the bottom.

- [4] Remove the 2 SCREWS 895161.
- [5] Lift the PIPETTE LOCATOR.
- [6] Remove:

- SCREW 793701
- SPOT DETECTOR SENSOR

- [7] Disconnect CONNECTOR J17 from the MOTHER BOARD or from the MASTER BOARD. See page 10-3 or 10-8.

- [5] Loosen the SCREW 793701 and adjust the position of the SPOT DETECTOR SENSOR.
- [6] Connect CONNECTOR J7.
- [7] Install the remaining parts, except the MAIN COVER, in the reversed order.
- [8] Check that the adjustment for the SPOT DETECTOR SENSOR is correct. See the Adjustments and Special Procedures section.
- [9] Check that the adjustment for the height of the TIP SEAT is correct. If necessary, see the Adjustments and Special Procedures section.

IMPORTANT

Adjusting the height of the TIP SEAT might cause changes in the results for some colorimetric chemistries that are sensitive to differences in metering conditions.

To install:

- [1] Install the new SPOT DETECTOR.
- [2] Insert a DT PIPETTE with a TIP into the PIPETTE LOCATOR.
- [3] Lift the PIPETTE LOCATOR.
- [4] Does the TIP touch the SPOT DETECTOR SENSOR?



Advance to step 5.



Advance to step 6.

- [10] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them:

HDLC
TP
TRIG

If any results are not within the limits for the DT60 ANALYZER, or if any values for the CONTROLS are changed, a full wet calibration should be done for those chemistries.

- [11] Return the DT60 ANALYZER to normal operating condition.

Adjustment specification for the Voltage of the SPOT DETECTOR SENSOR

+5.50 to +6.00 V dc

TEST POINTS:

For the Multi-Board Configuration

MULTIMETER TL-3424	
+	-
TP4 on the DRIVER BOARD	TP1 on the MOTHER BOARD

For the Single-Board Configuration

MULTIMETER TL-3424	
+	-
TP3 on the MASTER BOARD	TP10 on the MASTER BOARD

POTENTIOMETER:

For the Multi-Board Configuration: R32 on the DRIVER BOARD

For the Single-Board Configuration: R35 on the MASTER BOARD

Adjustment Specifications for the Height of the TIP SEAT

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Special Tools and Materials:

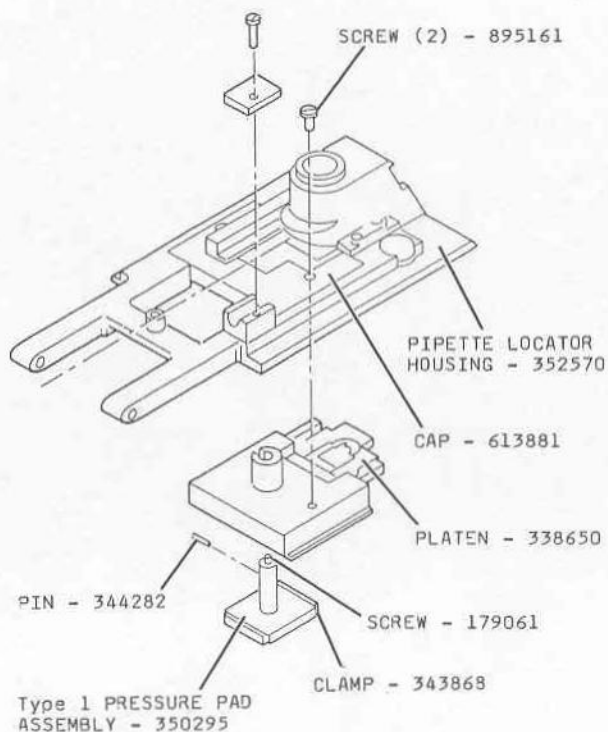
TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PIPETTE ADJUSTMENT WRENCH TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Includes all the parts on pages 10-39, 10-43, 10-47, 10-51, and 10-55. Not available as a separate item from PS.

PIPETTE LOCATOR ASSEMBLY*

To remove the Type 1 PRESSURE PAD and the PLATEN

- [1] Remove the PIPETTE LOCATOR COVER. See pages 10-23 and 10-24.
- [2] Loosen the SCREW 179061 and remove the PIN 344282.

NOTE

The PRESSURE PAD and the PLATEN will fall from the bottom.

- [3] Remove the 2 SCREWS 895161.

To Install:

- [1] Install the parts in the reversed order.

NOTE

If you are installing a type 2 PRESSURE PAD, see page 10-58, the instructions packed with the parts, or the Modifications and Parts Kit Installation section.

- [2] Check that the following adjustments are correct. See the Adjustments and Special Procedures section.

Adjustments
UPPER ARM
INCUBATOR - Temperature
TIP SEAT - Height

- [3] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them.

- If the UPPER ARM or the temperature of the INCUBATOR was adjusted:

AMYL
BUN
CREA
Hb
NH₃

- If the height of the TIP SEAT was adjusted: HDLC
TP
TRIG

If the results for any of these chemistries indicate changed values for the control fluids, a full wet calibration should be done.

- [4] Return the DT60 ANALYZER to the normal operating condition.

IMPORTANT

The adjustment of the UPPER ARM controls the position of the PRESSURE PAD. Adjusting the UPPER ARM might cause a difference in the temperature of the INCUBATOR. Some colorimetric chemistries are sensitive to variations in the temperature during the time in the INCUBATOR.

Adjustment specifications for the UPPER ARM, with Type 1 PRESSURE PAD

- When Option 68 is executed for 20 steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.
- With the RACKS in home-position, and a with slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

IMPORTANT

Adjusting the temperature of the INCUBATOR might cause the test results for "AMYL", "BUN", "CREA", "Hb", and "NH₃" to change. Process Kodak Ektachem CONTROLS for any of these chemistries if the DT60 ANALYZER is calibrated for them. A full wet calibration must be done for any chemistry or chemistries with changed results.

Adjustment specification for the temperature of the INCUBATOR

The calculated average of 3 high and 3 low temperatures measured at the Spotting Station must be 36.7 to 37.3°C (98 to 99°F).

POTENTIOMETER:

Multi-board configuration: R58 on the DRIVER BOARD

Single-board configuration: R73 on the MASTER BOARD

Adjustment Specifications for the Height of the TIP SEAT

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Special Tools and Materials:

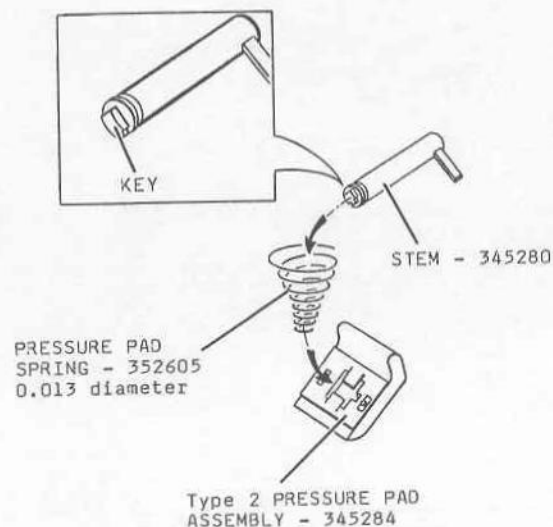
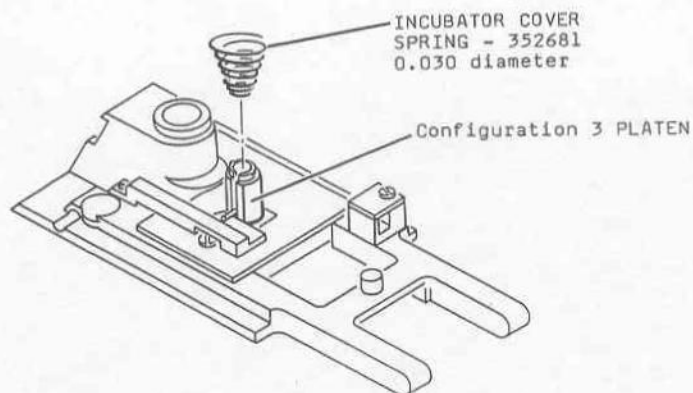
TIP HEIGHT ADJUSTMENT GAUGE TL-3446
PIPETTE ADJUSTMENT WRENCH TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



Type 2 PRESSURE PAD PARTS ASSEMBLY - 352706*
* Includes BAFFLE - 345282, page 77

To remove the Type 2 PRESSURE PAD and the PLATEN

- [1] Remove the PIPETTE LOCATOR COVER. See pages 10-23 and 10-24.
- [2] Remove and keep the INCUBATOR COVER SPRING.
- [3] Pull apart the PRESSURE PAD and the STEM.
- [4] Remove and discard the PRESSURE PAD SPRING and the PRESSURE PAD.
- [5] Remove the STEM through the top of the TOWER. Discard the STEM.

To install

- [1] Insert the STEM through the top of the PLATEN.
- [2] Install the PRESSURE PAD SPRING onto the bottom of the STEM. The narrow end of the SPRING should be toward the bottom end of the STEM and should seat in the SLOT.

NOTE

Check that the KEY on the STEM is correctly aligned with the hole in the PRESSURE PAD.

- [3] Install the PRESSURE PAD onto the end of the STEM. Press the PRESSURE PAD into position on the STEM until it seats and holds.
- [4] Check that the PRESSURE PAD ASSEMBLY can be rotated freely.
- [5] If the PLATEN is configuration 3, install the INCUBATOR COVER SPRING on the TOWER.

CAUTION

Frequent removal and installation of the STEM can cause damage or wear on the surfaces in the PRESSURE PAD ASSEMBLY.

- [6] Install the PIPETTE LOCATOR COVER. If necessary, see the Adjustments and Special Procedures section.
- [7] Check that the following adjustments are correct. See the Adjustments and Special Procedures section.

Adjustments
UPPER ARM
INCUBATOR - Temperature
TIP SEAT - Height

[8] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them.

- If the UPPER ARM or the temperature of the INCUBATOR was adjusted:

AMYL
BUN
CREA
Hb
NH₃

- If the height of the TIP SEAT was adjusted: HDLC
TP
TRIG

If the results for any of these chemistries indicate changed values for the control fluids, a full wet calibration should be done.

[9] Return the DT60 ANALYZER to the normal operating condition.

IMPORTANT

The adjustment of the UPPER ARM controls the position of the PRESSURE PAD. Adjusting the UPPER ARM might cause a difference in the temperature of the INCUBATOR. Some colorimetric chemistries are sensitive to variations in the temperature during the time in the INCUBATOR.

Adjustment specifications for the UPPER ARM, with Type 2 PRESSURE PAD

- When Option 68 is executed for 70 steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.
- With the RACKS in home position, and a with slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

IMPORTANT

Adjusting the temperature of the INCUBATOR might cause the test results for "AMYL", "BUN", "CREA", "Hb", and "NH₃" to change. Process Kodak Ektachem CONTROLS for any of these chemistries if the DT60 ANALYZER is calibrated for them. A full wet calibration must be done for any chemistry or chemistries with changed results.

Adjustment specification for the temperature of the INCUBATOR

The calculated average of 3 high and 3 low temperatures measured at the Spotting Station must be 36.7 to 37.3°C (98 to 99°F).

POTENTIOMETER:

Multi-board configuration: R58 on the DRIVER BOARD

Single-board configuration: R73 on the MASTER BOARD

Adjustment Specifications for the Height of the TIP SEAT

The height of the TIP is set with the TIP HEIGHT ADJUSTMENT GAUGE TL-3446. The top of the INNER CYLINDER of the TIP HEIGHT ADJUSTMENT GAUGE must be flush with the top of the OUTER CYLINDER, within 0.051 mm (0.002 in.).

Special Tools and Materials:

TIP HEIGHT ADJUSTMENT GAUGE TL-3446

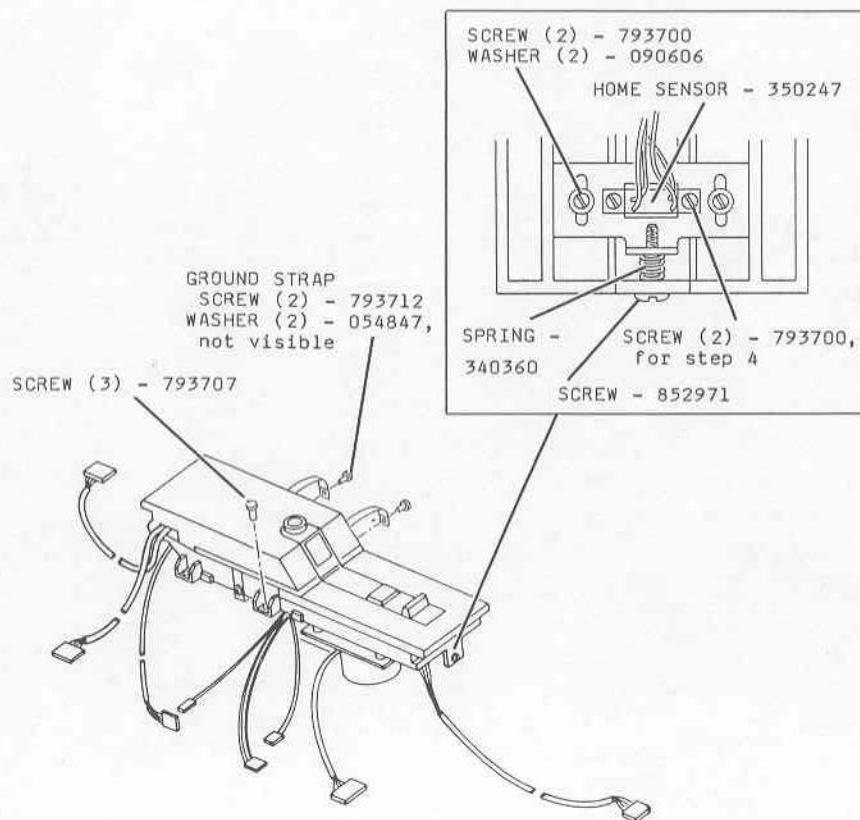
PIPETTE ADJUSTMENT WRENCH TL-3455

NOTE

The PIPETTE ADJUSTMENT WRENCH TL-3455 was deleted from Parts Services stock. Use a SCREWDRIVER or a HEX WRENCH if TL-3455 is not available.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Includes all the parts on pages 10-59, 10-61, 10-65, 10-67, and 10-71.
Not available as a separate item from PS.

TRACK ASSEMBLY*

To remove the HOME SENSOR:

- [1] Remove:
 - DISPOSAL CUP, see page 10-11
 - FORS GUARD, see page 10-25
 - 3 SCREWS 793707
 - 2 GROUND STRAP SCREWS 793712
 - 2 WASHERS 054847
- [2] Move the MECHANICAL MODULE backward.
- [3] Lift the MECHANICAL MODULE and disconnect CONNECTOR J19 from the MOTHER BOARD or the MASTER BOARD.
See page 10-3 or 10-8.
- [4] Remove:
 - 2 SCREWS 793700
 - HOME SENSOR 350247

If the D_R values are not correct, the FE must do the Correction Factors procedure, and the DT60 ANALYZER must be calibrated.

- [4] Return the DT60 ANALYZER to normal operating condition.

Adjustment specifications for the HOME SENSOR/LOWER RACK

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at Step Count 86, and
- move down off the TRAILING EDGE of the slide at Step Count 87, 88, or 89.

To install:

IMPORTANT

To prevent intermittent F19 error codes, avoid bending the HOME SENSOR when you install the 2 SCREWS. Overtightening the 2 SCREWS can bend the SENSOR.

- [1] Install the parts in the reversed order.
- [2] Check that the adjustment for the HOME SENSOR/LOWER RACK is correct. See the Adjustments and Special Procedures section.
- [3] Do the D_R procedure. See the Adjustments and Special Procedures section.

IMPORTANT

If the D_R values are correct, the Correction Factors procedure and calibration are not necessary.

Specifications for the D_R Procedure

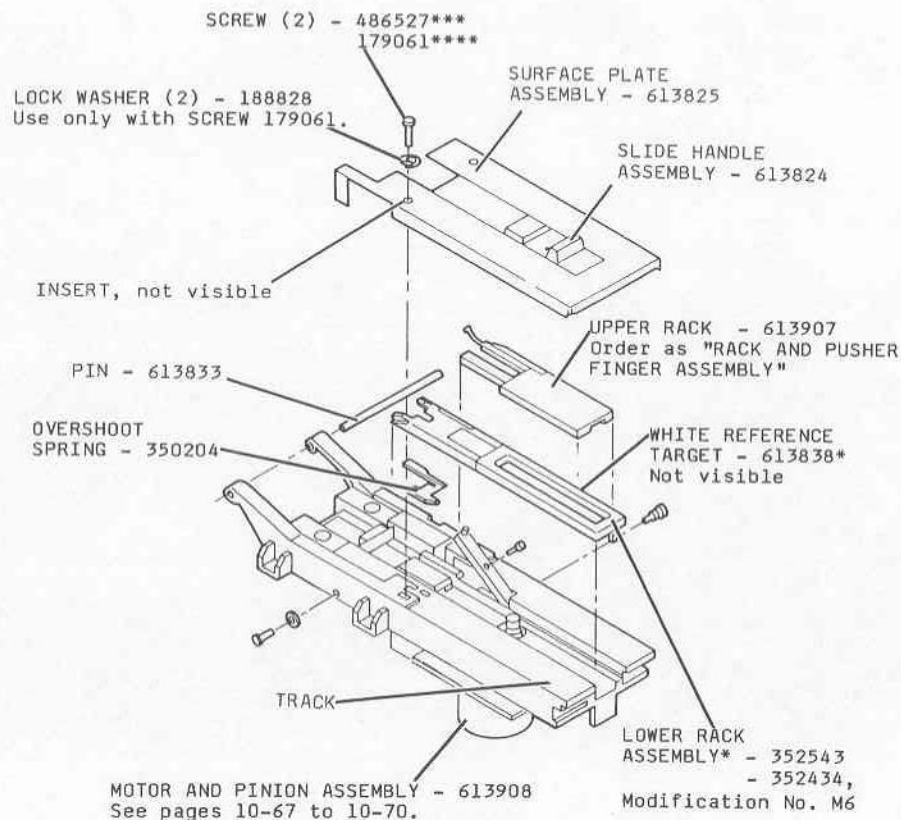
For white readings, the D_R result must be within ± 0.025 of the value on the LABEL of the box for the WHITE REFERENCE SLIDE TL-3344.

For black readings, the D_R result must be within ± 0.05 of the value on the LABEL of the box for the BLACK REFERENCE SLIDE TL-3345.

IMPORTANT

If you do the Correction Factors procedure, a full wet calibration must be done for all colorimetric chemistries that use any LED or LEDs that have correction factors revised.

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



.....
• CAUTION •
.....

* Do not use alcohol to clean the bottom of the LOWER RACK. Alcohol might change the reflectance of the WHITE REFERENCE TARGET.

** Includes all the parts on pages 10-59, 10-61, 10-65, 10-67, and 10-71.

Not available as a separate item from PS.

*** Machine screw - Serial Nos. below 60009000

**** Self-tapping screw - Serial Nos. 60009000 and above

TRACK ASSEMBLY**

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To remove the UPPER RACK or LOWER RACK

- [1] Execute option 3 for 1 cycle to move the UPPER RACK and LOWER RACK to the home position.
- [2] Move the MAIN POWER SWITCH to the "0" position.
- [3] Remove the MAIN COVER.
- [4] Move the PIPETTE LOCATOR up.
- [5] Remove:
 - 2 original SCREWS, or the 2 SCREWS 486527
 - 2 LOCK WASHERS, if necessary
- [6] Remove the SURFACE PLATE.
- [7] Make a pencil mark to indicate the position of the front edge of the LOWER RACK on the TRACK.
- [8] Make a separate pencil mark to indicate the position of the front edge of the UPPER RACK on the TRACK.

NOTE

The marks will make the installation of the RACKS easier.

.....
• CAUTION •
.....

Do not touch the WHITE REFERENCE TARGET.

- [9] Remove the UPPER RACK and, if necessary, the LOWER RACK.

To install

- [1] If the LOWER RACK was removed, install it. Install the UPPER RACK. Align the front edges of the RACKS with the marks made in steps 7 and 8.

NOTE

Check that the OVERSHOOT SPRING is in the correct position before you do step 2.

- [2] Install the SURFACE PLATE.

IMPORTANT

If you are installing the original SCREWS, a LOCK WASHER must be installed with each SCREW to prevent the INSERT from lifting and causing the SURFACE PLATE to be lifted above the surface of the Spotting Station. LOCK WASHERS should not be installed with the SCREWS 486527.

- [3] Install the 2 original SCREWS and 2 LOCK WASHERS, or install 2 SCREWS 486527.
- [4] Move the PIPETTE LOCATOR down.

NOTE

This procedure is continued on the following page.

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- [5] Do the following adjustments in the given sequence. See the Adjustments and Special Procedures section.

Adjustments
HOME SENSOR/LOWER RACK
UPPER RACK
UPPER ARM
LOWER ARM

- [6] Do the D_R procedure. See the Adjustments and Special Procedures section.

NOTE

If the D_R values are correct, the Correction Factors procedure and calibration are not necessary.

If the D_R values are not correct, the FE must do the Correction Factors procedure, and the DT60 ANALYZER must be calibrated.

- [7] Return the DT60 ANALYZER to the normal operating condition.

Adjustment specifications for the HOME SENSOR/LOWER RACK

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at Step Count 86, and
- move down off the TRAILING EDGE of the slide at Step Count 87, 88, or 89.

Adjustment specification for the UPPER RACK

After option 68 is executed for -59 steps, the gap between the PUSHER FINGER and a slide placed vertically against the front edge of the INCUBATOR should be 0.152 to 0.584 mm (0.005 to 0.023 in.).

Special Tools: FEELER GAUGES TL-1384 or TL-2372

Adjustment specifications for the UPPER ARM

- When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

NOTE

For a type 1 PRESSURE PAD, the step count is 20.
For a type 2 PRESSURE PAD, the step count is 70.

- With the RACKS in the home-position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

Adjustment specifications for the LOWER ARM

- When the UPPER RACK is in the home-position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

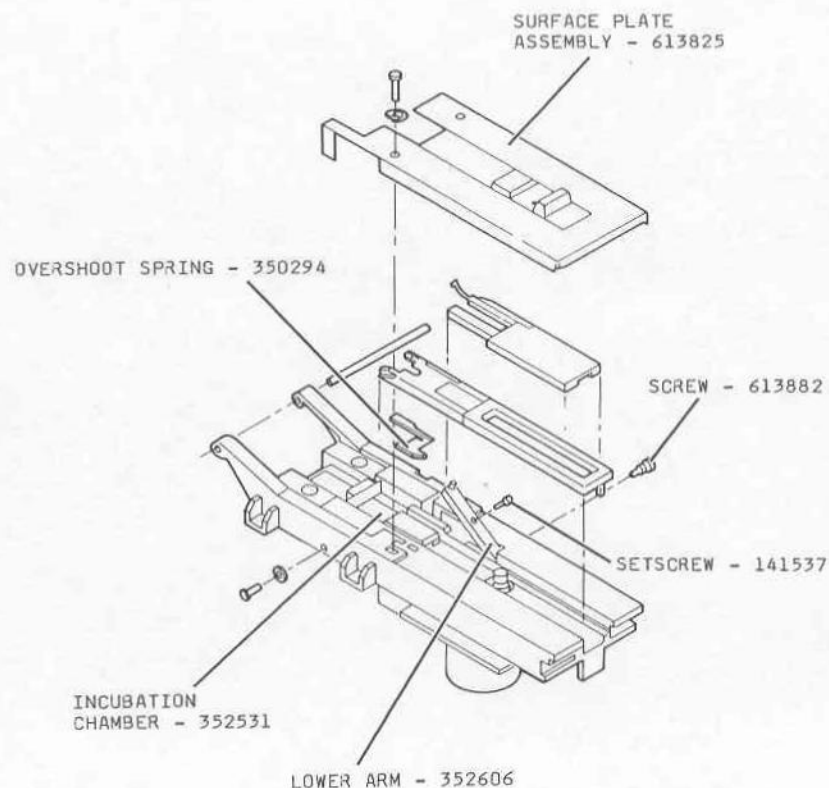
Specifications for the D_R Procedure:

- For white readings, the D_R result must be within ± 0.025 of the value on the LABEL of the box for the WHITE REFERENCE SLIDE TL-3344.
- For black readings, the D_R result must be within ± 0.05 of the value on the LABEL of the box for the BLACK REFERENCE SLIDE TL-3345.

IMPORTANT

If you do the Correction Factors procedure, a full wet calibration must be done for all colorimetric chemistries that use any LED or LEDs that have correction factors revised.

If a Kodak employee calibrates the DT60 ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Includes all parts on pages 10-59, 10-61, 10-65, 10-67, and 10-71.
Not available as a separate item from PS.

TRACK ASSEMBLY*

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To remove the LOWER ARM

- [1] Move the PIPETTE LOCATOR up.
- [2] Remove the SURFACE PLATE. See pages 10-61 and 10-62.

NOTE

Do not remove the UPPER RACK.

- [3] Remove:
 - SCREW 613882
 - LOWER ARM

To install

- [1] Install:
 - LOWER ARM
 - SCREW 613882

IMPORTANT

Check that the OVERSHOOT SPRING is in the correct position.

If the original SCREWS are used, a LOCK WASHER must be installed with each SCREW to prevent the INSERT from lifting and causing the SURFACE PLATE to be lifted above the surface of the Spotting Station.

- [2] Install the SURFACE PLATE. See pages 10-61 and 10-62.
- [3] Move the MAIN POWER SWITCH to the "1" position.
- [4] During initializing, check that the PUSH ROD on the LOWER ARM moves up and down and has clearance with the hole.
- [5] Move the PIPETTE LOCATOR down.
- [6] Do the adjustment for the LOWER ARM. See the Adjustments and Special Procedures section.
- [7] Return the DT60 ANALYZER to normal operating condition.

Adjustment specifications for the LOWER ARM

- When the UPPER RACK is in the home position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

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SCREW (3) - 793707
for step 2,
MECHANICAL MODULE

SCREW - 793712

SCREW - 793712

MECHANICAL MODULE

SCREW (2) - 793707

WASHER (2) - 095533

MOTOR AND PINION
ASSEMBLY - 613908

CONNECTOR J16

SCREW (4) - 793714
for step 2,
MOTOR AND PINION ASSEMBLY

* Includes all parts on pages 10-59, 10-61,
10-65, 10-67, and 10-71.
Not available as a separate item from PS.

TRACK ASSEMBLY*

To remove the MECHANICAL MODULE

NOTE

The MECHANICAL MODULE
includes the following
assemblies:

- TRACK ASSEMBLY
- PIPETTE LOCATOR
- FORS WEIGHT ASSEMBLY

The FORS ASSEMBLY is
installed on the MECHANICAL
MODULE.

- [1] Execute option 3 for 1 cycle
to move the LOWER RACK to
the home position.

- [2] Remove:

- DISPOSAL CUP, see page
10-11
- FORS GUARD, see page 10-25
- 3 SCREWS 793707

- [3] Disconnect the following
CONNECTORS from the MOTHER
BOARD or from the MASTER
BOARD. See pages 10-2 and
10-3 or 10-7 and 10-8.

- | | | |
|-------|-------|-------|
| - J13 | - J19 | - J24 |
| - J16 | - J20 | - J28 |
| - J17 | - J21 | - J35 |
| - J18 | | |

.....
• CAUTION •
.....

Do not place excessive
weight on the FORS CIRCUIT
BOARD ASSEMBLY.

- [4] Move the MECHANICAL MODULE
backward, then up, to
remove it.

To install

- [1] Install the parts in the
reversed order.

- [2] Check that the adjustment
for the HOME SENSOR/LOWER
RACK is correct. See the
Adjustments and Special
Procedures section.

- [3] Do the DR procedure. See
the Adjustments and Special
Procedures section.

NOTE

If the DR values are
correct, a correction
factors procedure and
calibration are not
necessary.

If the DR values are not
correct, the FE must do the
correction factors
procedure, and the
DT60 ANALYZER must be
calibrated.

- [4] Return the DT60 ANALYZER to
normal operating condition.

To remove the MOTOR AND PINION ASSEMBLY

- [1] Remove the MECHANICAL
MODULE. See the above
procedure.

- [2] Remove:

- 4 SCREWS 792714
- MOTOR AND PINION ASSEMBLY

To install the MOTOR AND PINION ASSEMBLY

- [1] Install the parts in the reversed order.
- [2] In sequence, check that the following adjustments are correct.
See the Adjustments and Special Procedures section.

Adjustments
HOME SENSOR/LOWER RACK
UPPER RACK

- [3] Do the D_R procedure. See the Adjustments and Special Procedures section.

NOTE

If the D_R values are correct, the Correction Factors procedure and calibration are not necessary.

If the D_R values are not correct, the FE must do the Correction Factors procedure, and the DT60 ANALYZER must be calibrated.

- [4] Return the DT60 ANALYZER to normal operating condition.

Adjustment specifications for the HOME SENSOR/LOWER RACK

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at Step Count 86, and
- move down off the TRAILING EDGE of the slide at Step Count 87, 88, or 89.

Adjustment specification for the UPPER RACK

After option 68 is executed for -59 steps, the gap between the PUSHER FINGER and a slide placed vertically against the front edge of the INCUBATOR should be 0.152 to 0.584 mm (0.005 to 0.023 in.).

Specifications for the DR Procedure:

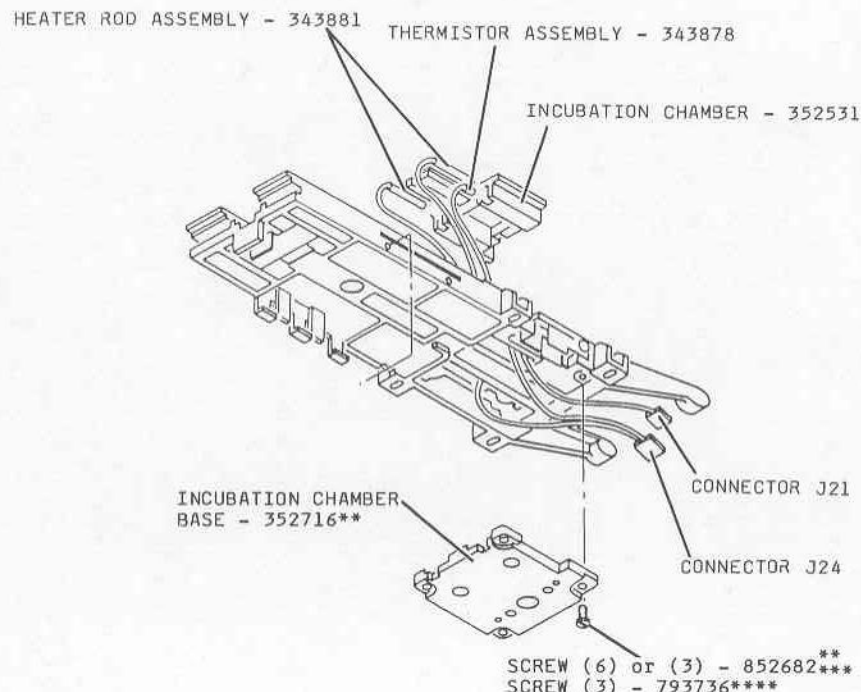
For white readings, the D_R result must be within ± 0.025 of the value on the LABEL of the box for the WHITE REFERENCE SLIDE TL-3344.

For black readings, the D_R result must be within ± 0.05 of the value on the LABEL of the box for the BLACK REFERENCE SLIDE TL-3345.

IMPORTANT

If you do the Correction Factors procedure, a full wet calibration must be done for all colorimetric chemistries that use any LED or LEDs that have correction factors revised.

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Includes all parts on pages 10-59, 10-61, 10-65, 10-67, and 10-71.

Not available as a separate item from PS.

** The INCUBATION CHAMBER BASE has different configurations. Check if 6 SCREWS or 3 SCREWS are necessary.

*** Machine screw - Serial Nos. below 60009000

**** Self-tapping screw - Serial Nos. 60009000 and above

To remove the HEATER RODS and THERMISTOR

Special Tool: THERMAL COMPOUND TL-2192

[1] Remove:

- SURFACE PLATE, pages 10-61 and 10-62
- OVERSHOOT SPRING, page 10-61
- MECHANICAL MODULE, page 10-68
- PLATE, see page 10-13
- FORS ASSEMBLY, page 10-30
- 6 or 3 SCREWS 852682*, or 3 SCREWS 793736**
- INCUBATION CHAMBER BASE 352716
- INCUBATION CHAMBER 352531

IMPORTANT

Observe the path of the wires for the HEATER RODS.

- [2] To remove the HEATER RODS or the THERMISTOR, do:
- Hold the INCUBATION CHAMBER at an angle.
 - Pull out, with minimum force, the HEATER RODS or the THERMISTOR.

- [3] Disconnect, from the MOTHER BOARD or from the MASTER BOARD:

- CONNECTOR J24 for the HEATER RODS, or
- CONNECTOR J21 for the THERMISTOR

See page 10-3 or 10-8.

To install

.....
· CAUTION ·
.....

Remove any visible existing THERMAL COMPOUND TL-2192 that remains on any parts that will not be replaced.

- [1] Use new THERMAL COMPOUND TL-2192 and fill the holes or hole in the INCUBATION CHAMBER before inserting the HEATER RODS or THERMISTOR.
- [2] Install the HEATER RODS or THERMISTOR in the correct holes or hole.
- [3] Remove any excessive THERMAL COMPOUND TL-2192.

.....
· CAUTION ·
.....

Do not bend the wires excessively.

- [4] Connect CONNECTOR J24 or CONNECTOR J21.
- [5] Install the remaining parts in the reversed order.

TRACK ASSEMBLY*

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- [6] In sequence, check that the following adjustments are correct. See the Adjustments and Special Procedures section.

Adjustments
HOME SENSOR/LOWER RACK
UPPER RACK
LOWER ARM
UPPER ARM
INCUBATOR - Temperature
FORS ASSEMBLY - Illumin.

IMPORTANT

Adjusting the HOME SENSOR and the LOWER RACK might cause the D_R values to change.

- [7] Do the D_R procedure. See the Adjustments and Special Procedures section.

NOTE

If the D_R values are correct, the correction factors procedure is not necessary.

If the D_R values are not correct, the FE must do the correction factors procedure, and the DT60 ANALYZER must be calibrated for the chemistries that use any LED revised in the procedure.

- [8] If necessary, do the procedure to revise the correction factors.

IMPORTANT

The adjustment of the UPPER ARM controls the position of the PRESSURE PAD. Adjusting the UPPER ARM might cause the temperature in the INCUBATOR to change. Changing or adjusting the temperature of the INCUBATOR might cause changed test results for some colorimetric chemistries that are sensitive to the temperature during the time the slide is in the INCUBATOR.

- [9] Use Kodak Ektachem CONTROLS and process slides for the following chemistries if the DT60 ANALYZER is calibrated for them:

AMYL
BUN
CREA
Hb
NH₃

- [10] If the correction factors for any LED or LEDs were revised, the DT60 ANALYZER must be calibrated for the chemistries that use the revised LED or LEDs.

If the results for any of the chemistries in step 9 indicate changed values for the control fluids, a full wet calibration should be done for the chemistries with changed values.

Adjustment specifications for the HOME SENSOR/LOWER RACK

When Option 68 is executed with a slide in the INCUBATOR, the RIGHT PAWL must:

- remain up on the slide at Step Count 86, and
- move down off the TRAILING EDGE of the slide at Step Count 87, 88, or 89.

Adjustment specification for the UPPER RACK

After option 68 is executed for -59 steps, the gap between the PUSHER FINGER and a slide placed vertically against the front edge of the INCUBATOR should be 0.152 to 0.584 mm (0.005 to 0.023 in.).

Adjustment specifications for the LOWER ARM

- When the UPPER RACK is in the home-position, the PIN and the LEADING EDGE of the UPPER RACK should have minimum clearance and the PUSH ROD should be at the lowest point of travel.
- When the UPPER RACK moves toward the INCUBATOR, the LEADING EDGE of the UPPER RACK should smoothly engage, but not hit, the PIN on the LOWER ARM.

Adjustment specifications for the UPPER ARM

- When Option 68 is executed for a given number of steps, the UPPER ARM should touch, but not lift, the PIN on the STEM of the PRESSURE PAD.

NOTE

For a type 1 PRESSURE PAD, the step count is 20.
For a type 2 PRESSURE PAD, the step count is 70.

- With the RACKS in the home-position, and with a slide in the INCUBATOR WELL, the PRESSURE PAD should be lifted when the PIPETTE LOCATOR is moved down to the operating position.

Adjustment specification for the temperature of the INCUBATOR

The calculated average of 3 high and 3 low temperatures measured at the Spotting Station must be 36.7 to 37.3°C (98 to 99°F).

POTENTIOMETER:

Multi-board configuration: R58 on the DRIVER BOARD
Single-board configuration: R73 on the MASTER BOARD

Adjustment specifications for the FORS ASSEMBLY

For White Reference, check for A/D values of 3650 to 3850. If the correct values are not obtained, adjust the A/D values to 3690 to 3810. Each group of 5 values within 10 of each other.

For Black Reference A/D values must be -100 to +100. Each group of 5 values must be within 10 of each other.

Special Tools

FORS ADJUSTMENT BOARD TL-3340
MULTIMETER TL-3424

TEST POINTS on the FORS BOARD

TP6 for voltage through the LEDs
TP4 for control current
TP8 for gain
TP12 for ground

POTENTIOMETERS on the FORS ASSEMBLY

R25 to set null*
R26 to set gain of the AMPLIFIER
R29 to set the red LED
R30 to set the yellow LED
R31 to set the green LED

* Not all FORS ASSEMBLIES have R25. See the adjustment procedure for additional information.

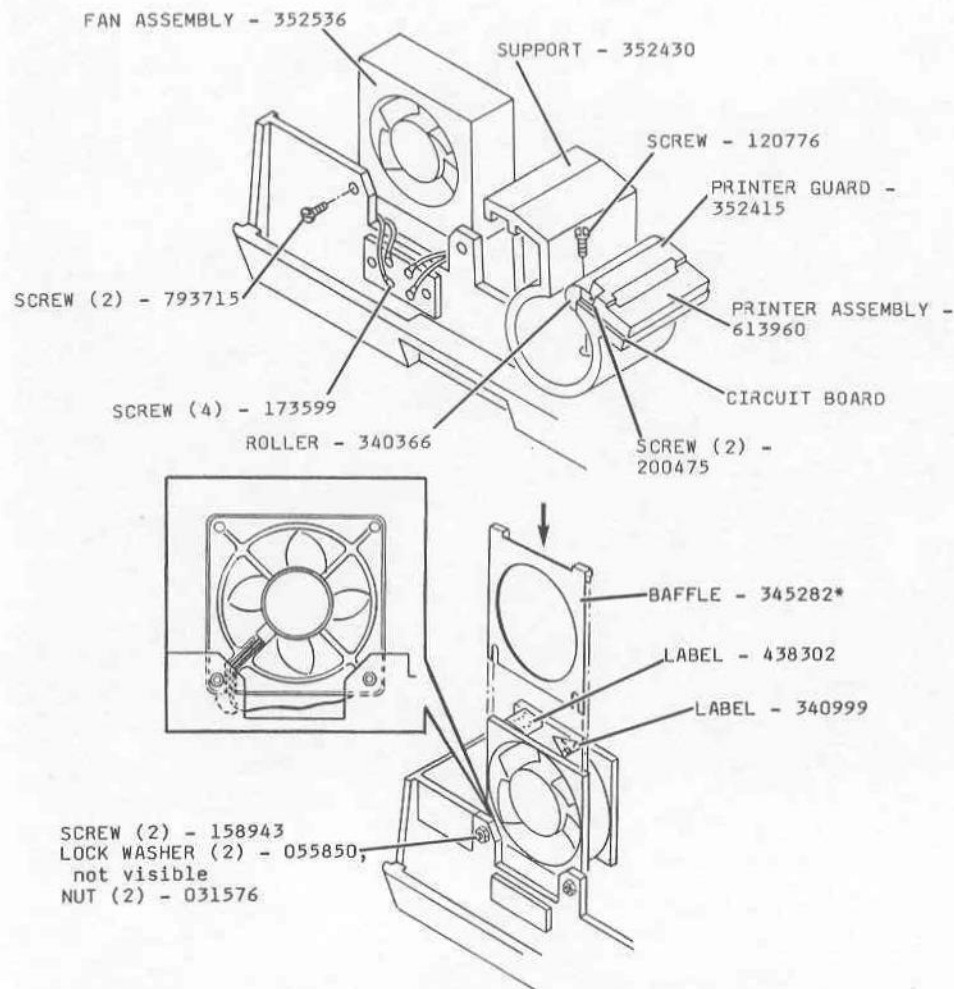
Specifications for the DR Procedure

For white readings, the D_R result must be within ± 0.025 of the value on the LABEL of the box for the WHITE REFERENCE SLIDE TL-3344.

For black readings, the D_R result must be within ± 0.05 of the value on the LABEL of the box for the BLACK REFERENCE SLIDE TL-3345.

IMPORTANT

If the DT60 ANALYZER is calibrated by a Kodak employee, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.



* Included in the Type 2 PRESSURE PAD PARTS ASSEMBLY 352706, page 55

IMPORTANT

- * Do not install the BAFFLE with a Type 1 PRESSURE PAD ASSEMBLY.
- * The BAFFLE must be installed with a Type 2 PRESSURE PAD ASSEMBLY.

To remove the PRINTER ASSEMBLY

- [1] Move the MAIN POWER SWITCH to the "0" position.
- [2] Remove the paper from the PRINTER.
- [3] Move the KEYBOARD PLATE to allow access to the POWER SUPPLY GUARD. See page 10-21.
- [4] Remove the POWER SUPPLY GUARD. See page 10-21.
- [5] Disconnect CONNECTORS J33 and J34 from the MOTHER BOARD or from the MASTER BOARD. See page 10-2 or page 10-7.

.....
 • CAUTION •

Avoid damage to the PRINTER. Do not touch, or apply pressure to, the small CIRCUIT BOARD.

- [6] Remove:
 - SCREW 120776
 - PRINTER ASSEMBLY 613960

To install:

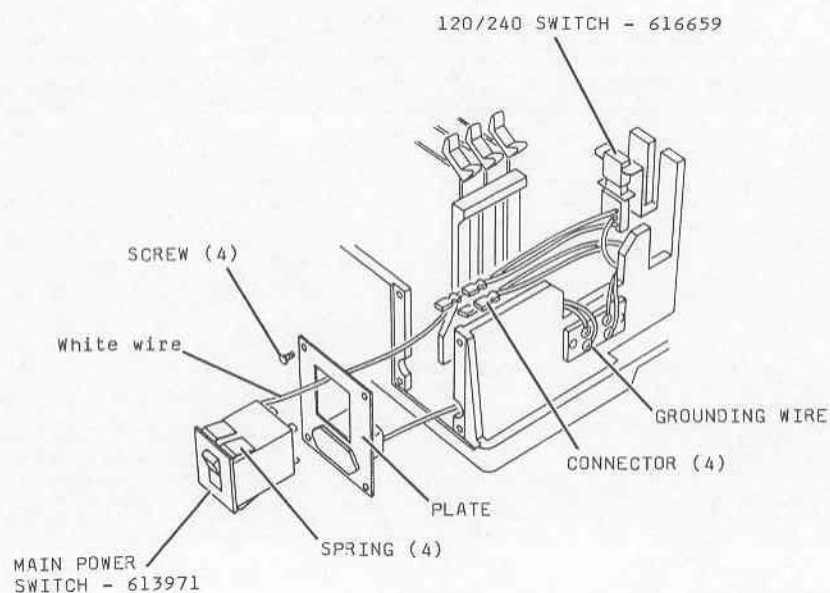
- [1] Install the parts in the reverse order.
- [2] Move the MAIN POWER SWITCH to the "1" position.
- [3] Enter option 4 to check that the PRINTER operates correctly and makes a correct printout of the characters.
- [4] If the contrast or quality of the printout is not optimum, do the adjustment for the PRINTER. See the Adjustments section.
- [5] Return the DT60 ANALYZER to normal operating condition.

Adjustment specification for the PRINTER - Character Density

Using paper available from Kodak, the 4 dots in the "." character must be separate. The 4 dots are visible through MAGNIFIER TL-1442.

POTENTIOMETER

VR101, on the PRINTER INTERFACE BOARD. Clockwise rotation increases density. Adjust the density of the printout to a maximum of 100 microseconds. See the illustration in the adjustment procedure.



Special Tools:

- SOLDERING IRON TL-2818

Additional Materials:

- HEAT SHRINK INSULATION

IMPORTANT

Observe and record the positions of the 4 CONNECTORS when you do step 8. The CONNECTORS must be in the same positions when you install the parts.

To remove the MAIN POWER SWITCH

- [1] Move the MAIN POWER SWITCH to the "0" position.

WARNING

Dangerous Voltage

- [2] Disconnect the POWER CORD.

.....
• CAUTION •
.....

Possible damage from electrostatic discharge.

- [3] Remove the MAIN COVER. See page 10-9.
- [4] If the DT60 ANALYZER is Single-Board configuration, remove the DRIVER BOARD. See page 10-1.
- [5] Disconnect CONNECTOR J11 from the MOTHER BOARD or from the MASTER BOARD. See page 10-2 or page 10-8.
- [6] Remove the FAN. See page 10-61.
- [7] Remove:

- 4 SCREWS
- PLATE

- [8] Disconnect the 4 CONNECTORS.

- [9] Use SOLDERING IRON TL-2818 and remove the white wire from the 120/240 SWITCH.

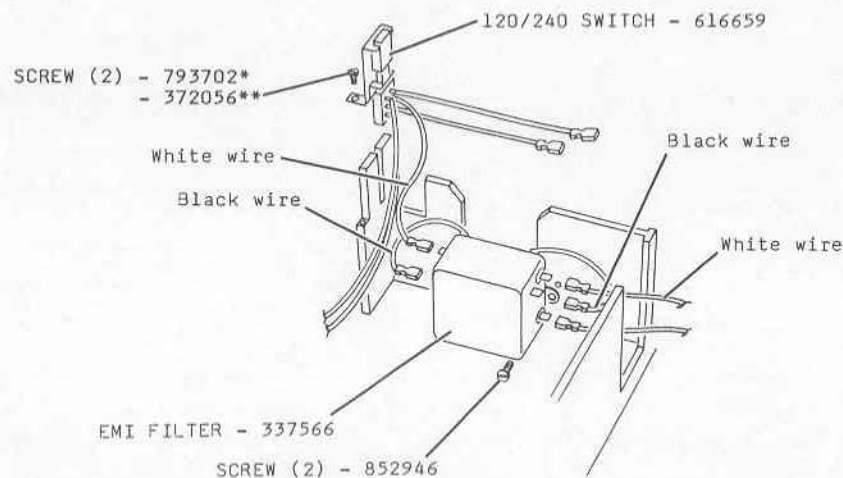
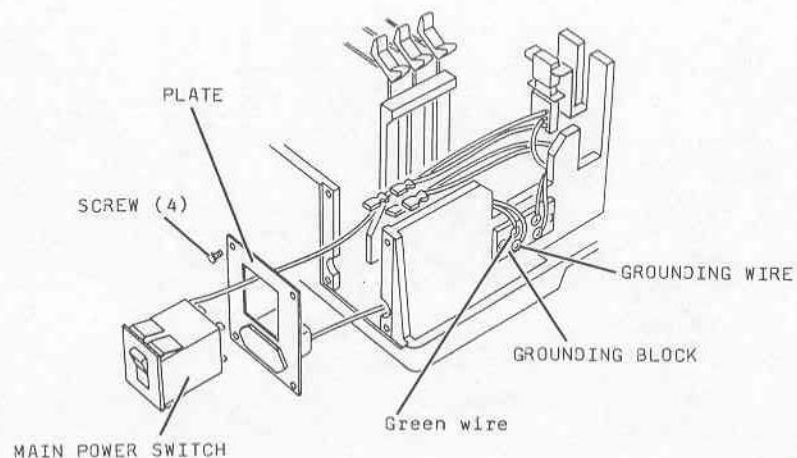
- [10] Press the 4 SPRINGS and remove the MAIN POWER SWITCH.

To install:

NOTE

Use the SOLDERING IRON TL-2818 and the HEAT SHRINK INSULATION to connect the white wire to the 120/240 SWITCH.

- [1] Install the parts in the reverse order.
- [2] Return the DT60 ANALYZER to normal operating condition.



* Machine screw - Serial Nos. below 60009000
 ** Self-tapping screw - Serial Nos. 60009000 and above

To remove the EMI FILTER

- [1] Move the MAIN POWER SWITCH to the "0" position.

WARNING

Dangerous Voltage

- [2] Disconnect the POWER CORD.

.....
 • CAUTION •

Possible damage from electrostatic discharge.

- [3] Remove:
- COVER, see page 10-11
 - DRIVER BOARD, see page 10-1
- [4] Disconnect CONNECTOR J11 from the MOTHER BOARD or from the MASTER BOARD. See page 10-2 or 10-8.

IMPORTANT

Observe the positions of the black wires and white wires connected to the EMI FILTER.

- [5] Remove:
- FAN, see page 10-61
 - 4 SCREWS
 - PLATE
- [6] Disconnect from the GROUNDING BLOCK, the GROUNDING WIRE for the MAIN POWER SWITCH.

- [7] Move the MAIN POWER SWITCH to provide access to the EMI FILTER.
- [8] Remove the paper from the PRINTER ASSEMBLY.
- [9] Loosen the SCREW 120776 and move the PRINTER ASSEMBLY forward. See page 10-62.
- [10] Remove the 2 SCREWS 372056.
- [11] Pull the 120/240 SWITCH up and move it to provide access for disconnecting the white and black wires at the EMI FILTER.
- [12] Disconnect the white and black wires from the EMI FILTER.
- [13] Disconnect, from the GROUNDING BLOCK, the green wire for the EMI FILTER.
- [14] Remove:
- 2 SCREWS 852946
 - EMI FILTER 337566

To install

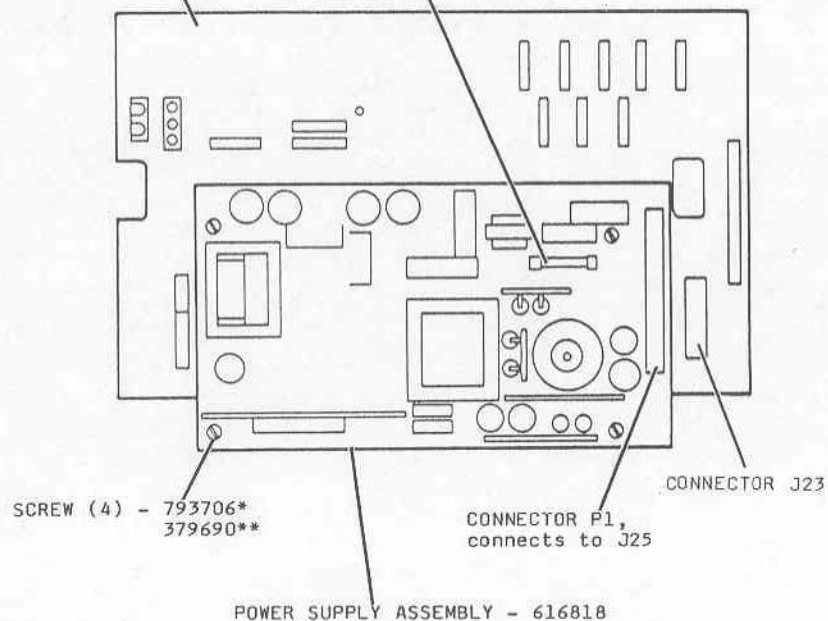
IMPORTANT

The wires must be in the same positions when you install the parts.

- [1] Install the parts in the reverse order.
- [2] Return the DT60 ANALYZER to normal operating condition.

MOTHER BOARD ASSEMBLY - 352495
See page 10-85.

FUSE - 132927



* Machine screw - Serial Nos. below 60009000
** Self-tapping screw - Serial Nos. 60009000 and above

To remove the POWER SUPPLY

- [1] Move the KEYBOARD PLATE ASSEMBLY to provide access to the POWER SUPPLY GUARD.
In a Multi-Board Configuration unit, place the KEYBOARD PLATE ASSEMBLY on top of the CPU, I/O, and DRIVER BOARDS.
- [2] Remove the POWER SUPPLY GUARD. See page 10-21.
- [3] Disconnect CONNECTOR J23 from the MOTHER BOARD or the MASTER BOARD. See page 10-2 or 10-8.
- [4] Remove the 4 SCREWS.
- [5] Lift and remove the POWER SUPPLY ASSEMBLY 616818.

To Install:

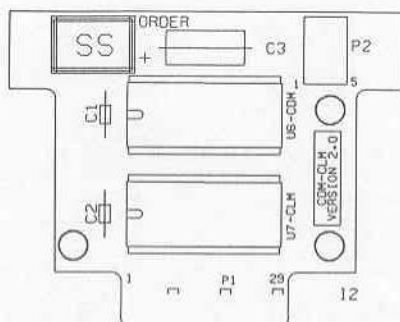
- [1] Install the parts in the reverse order.
- [2] Apply CONTACT LUBRICANT TL-3773. See the Adjustments and Special Procedures section. Do the Checkout Procedure for the POWER SUPPLY. See the Diagnostics section.
- [3] Return the DT60 ANALYZER to normal operating condition.

Special Tools:

MULTIMETER TL-3424
FORS ADJUSTMENT TL-3340
CONTACT LUBRICANT TL-3773

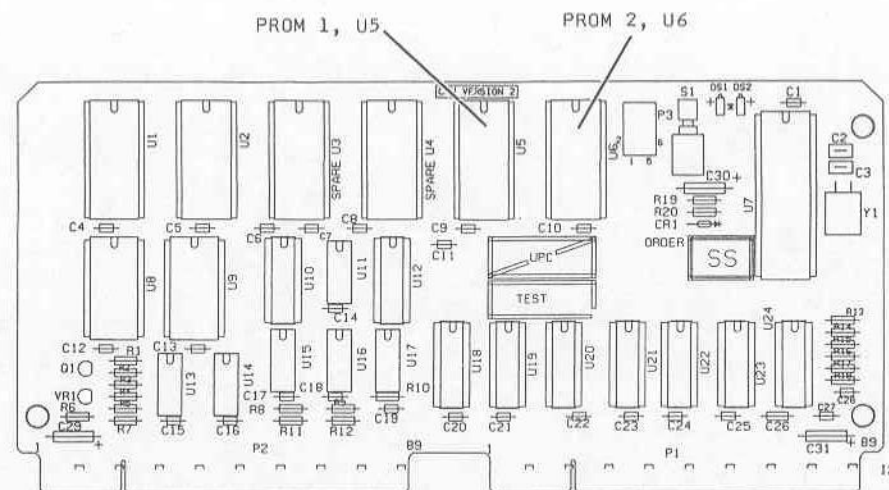
Specifications for the POWER SUPPLY:

Voltage Measurement:	+	-	Specifications: V dc
+5 V dc circuit from POWER SUPPLY	TL-3340, TP5	TL-3340, TP12	+4.85 to +5.15
+15 V dc circuit from POWER SUPPLY	TL-3340, TP1	TL-3340, TP12	+14.5 to +15.5
-15 V dc circuit from POWER SUPPLY	TL-3340, TP3	TL-3340, TP12	-14.5 to -15.5
+12 V dc circuit from POWER SUPPLY	FAN, J11-1	FAN, J11-22	+11.0 to +13.0



* To be used with version 9.0 software.
 ** To be used with version 10.7 software and above.

CDM/CLM CIRCUIT BOARD ASSEMBLY - 613956*
 - 352399**



CPU CIRCUIT BOARD ASSEMBLY - 613941*		
Description	Location	Part No.
INTEGRATED CIRCUIT	U12*	616767

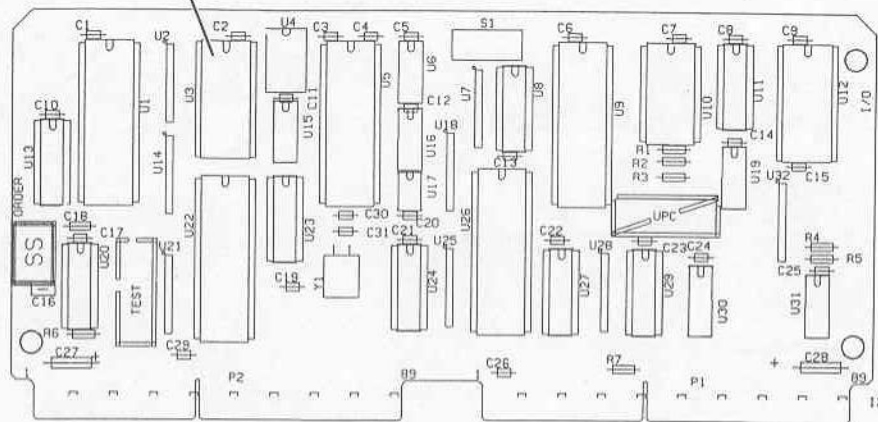
CPU CIRCUIT BOARD ASSEMBLY - 352616** or 352487***		
Description	Location	Part No.
PROM 1	U5	352806****
PROM 2	U6	352807****
INTEGRATED CIRCUIT	U8**	616767

* To be used with version 9.0 software. The software PROMS are included with the CIRCUIT BOARD and are not separate items in PS stock.
 ** To be used with version 10.7 software and above.
 *** To be used with version 11.0 software.
 **** All replacement parts will be version 11.0 software.

CPU CIRCUIT BOARD ASSEMBLY - 613941*
 - 352616**
 - 352487***

For Multi-Board Configuration only

INTEGRATED CIRCUIT U3



I/O CIRCUIT BOARD ASSEMBLY - 352520**		
Description	Location	Part No.
INTEGRATED CIRCUIT	U3	337353**

* To be used with version 9.0 software.
 ** To be used with version 10.7 software and above.

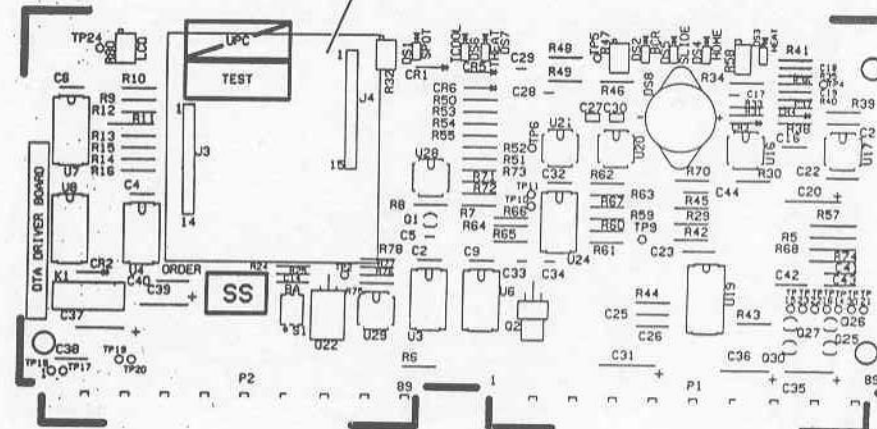
I/O CIRCUIT BOARD ASSEMBLY - 343937*
 352520**
 For Multi-Board Configuration only

XP3100-10

10-89

6/88

PRINTER INTERFACE CIRCUIT
 BOARD ASSEMBLY - 613957



DRIVER CIRCUIT BOARD ASSEMBLY - 352387,
 for Multi-Board Configuration only

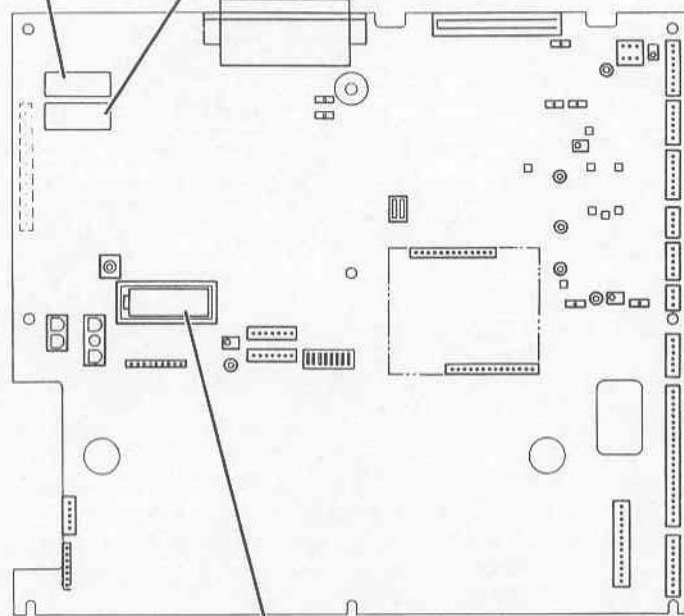
XP3100-10

10-90

6/88

INTEGRATED CIRCUIT U6

INTEGRATED CIRCUIT U14



BATTERY - 227322*

MASTER BOARD ASSEMBLY - 352655		
Description	Location	Part No.
PROM 1	U14	352806**
PROM 2	U6	352807**

* Not included with the MASTER BOARD 352655.
** Version 11.0 software.

MASTER BOARD ASSEMBLY - 352655, for Single-Board Configuration only

To remove the MASTER BOARD

Special Tools: MULTIMETER TL-3424
WRIST STRAP TL-3380
or TL-3381

- [1] If possible, execute option 36 for a printout of the colorimetric correction factors. See the Options section. Keep the printout.
- [2] If possible, execute option 32 for a printout of the colorimetric calibration parameters and generation numbers. See the Options section. Keep the printout.

IMPORTANT

On equipment with software version 10.7 and above, if a DTSC MODULE is connected to the DT60 ANALYZER, calibration for rate chemistries will be necessary after a replacement for the MASTER BOARD is installed.

- [3] Move the MAIN POWER SWITCH for the DT60 ANALYZER to the "0" position.
- [4] If a DTSC MODULE is connected, move that MAIN POWER SWITCH to the "0" position.

WARNING

Dangerous voltage

- [5] Disconnect the POWER CORD from the main power. See page 10-17.

.....

..CAUTION..

Possible damage from electrostatic discharge.

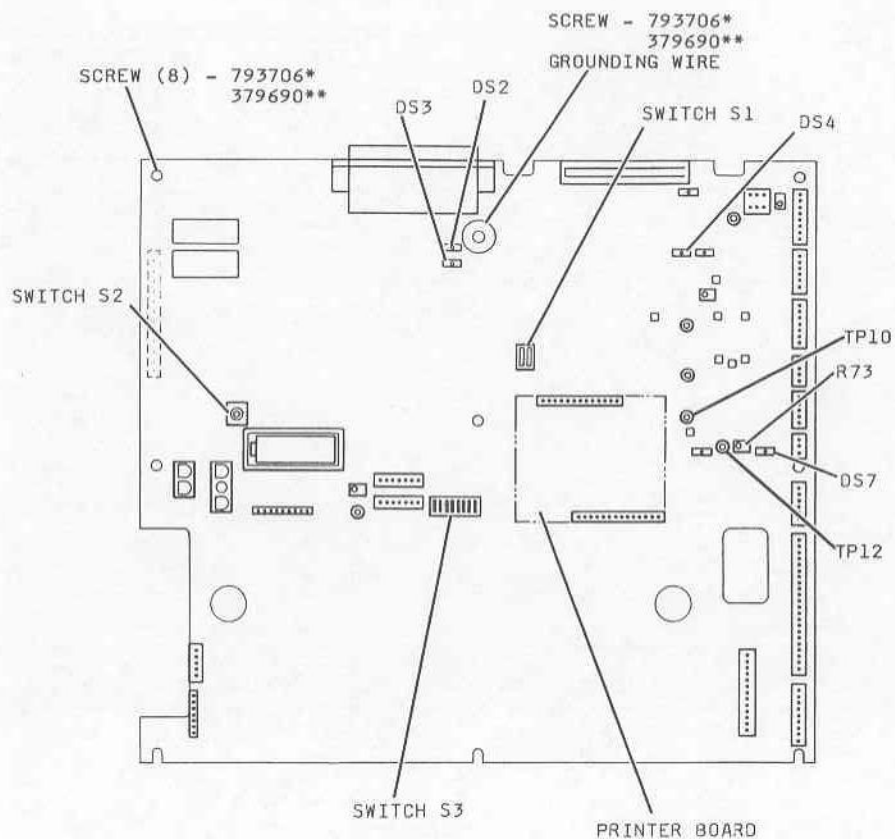
- [6] Connect the WRIST STRAP to the GROUNDING BLOCK. See page 10-81.
- [7] Remove:
 - KEYBOARD PLATE ASSEMBLY, see page 10-21
 - POWER SUPPLY GUARD, see page 10-21

WARNING

Dangerous voltage

The ANALYZER must be deenergized a minimum of 5 minutes before you do step 8.

- [8] Disconnect CONNECTOR P1 at J25 on the POWER SUPPLY. See page 10-83.
- [9] Disconnect CONNECTOR J23 from the MASTER BOARD. See page 10-8.
- [10] Remove:
 - 4 SCREWS 793706, or 279690, page 10-83
 - POWER SUPPLY ASSEMBLY, page 10-73
 - POWER SUPPLY INSULATING PAD, under the POWER SUPPLY ASSEMBLY
- [11] Disconnect all of the remaining CONNECTORS.
- [12] Remove the 2 SCREWS 793701, or 372056, and the CDM/CLM BOARD. See page 10-15.



* Machine screw - Serial Nos. below 60009000
 ** Self-tapping screw - Serial Nos. 60009000 and above

MASTER BOARD ASSEMBLY - 352655, for Single-Board Configuration only

[13] Is an ADAPTER BOX installed on the DT60 ANALYZER?



Advance to
step 14.



Advance to
step 15.

[14] Remove the ADAPTER BOX ASSEMBLY. See page 10-19.

[15] Remove:

- SCREW 793706, or 379690, and the GROUNDING WIRE
- 8 SCREWS 793706
- MASTER BOARD 352655

[16] Remove from the MASTER BOARD, and keep:

- PRINTER BOARD
- BATTERY 227322
- INTEGRATED CIRCUITS U6 and U14

NOTE

Keep the BATTERY to use as a spare part.

[17] Connect:

MULTIMETER TL-3424	
+	-
TP10	TP12

[18] Use the MULTIMETER TL-3424 to measure the resistance of POTENTIOMETER R73. Record the resistance.

[19] Use a "PARTS RETURN NOTICE" and return the old MASTER BOARD to PS.

To install the MASTER BOARD

NOTE

Use the WRIST STRAP TL-3380 or TL-3381 and connect the GROUNDING WIRE to the GROUNDING BLOCK.

- [1] Install the following parts on the new MASTER BOARD:
 - PRINTER BOARD
 - new BATTERY
 - INTEGRATED CIRCUITS U6 and U14
- [2] Check that SWITCH S1 is in the "OFF" position.
- [3] Check that the positions on SWITCH S3 match the positions of SWITCH S3 on the old MASTER BOARD. SWITCH S3 sets the baud rate.
- [4] Adjust POTENTIOMETER R73 to obtain the same resistance as the value recorded in step 18 of the removal procedure.

MULTIMETER TL-3424	
+	-
TP10	TP12

- [5] Install the MASTER BOARD and push it as far toward the back of the ANALYZER as possible.
- [6] Install the 9 SCREWS 793706, or 379690, and the GROUNDING WIRE.
- [7] Connect the GROUNDING WIRE to the GROUNDING BLOCK.
- [8] Install all of the remaining parts, except the MAIN COVER, in the reversed order.
- [9] Remove the WRIST STRAP.
- [10] Connect the POWER CORD.
- [11] Move the MAIN POWER SWITCH to the "1" position.

NOTE

The ANALYZER must be energized for a minimum of 15 minutes.

- [12] Use the MULTIMETER TL-3424 and check that the voltages for TEST PADS TP2, TP4 - TP9, and TP11 are correct. See the table on page 10-98.
- [13] Execute option 2 to check that LED DISPLAY DS7 for the HOME SENSOR operates.

- [14] Execute options 2 and 0 to check that LED DISPLAY DS4 for the SLIDE SENSOR operates.

- [15] Check that the following adjustments are correct. See the Adjustments and Special Procedures section.

Adjustments
PRINTER
LC DISPLAY
BAR CODE READER
SPOT DETECTOR SENSOR
INCUBATOR - Temperature

- [16] If a DTE MODULE is connected to the ANALYZER, process a slide to check that LED DISPLAYS DS2 and DS3 operate.
- [17] Move the MAIN POWER SWITCH for the DTSC MODULE to the "1" position.
- [18] Check that the DTSC MODULE initializes correctly.
- [19] Do the following procedure to clear data from the NONVOLATILE RAM:
 - Enter option 73.
 - Move the MAIN POWER SWITCH to the "0" position.
 - Wait 5 seconds.
 - Move the MAIN POWER SWITCH to the "1" position.
 - Check that "D19-MEMORY TEST" appears on the printout. This message indicates that the NONVOLATILE RAM is cleared.
- [20] Enter the original correction factors and the calibration parameters, if available, for the DT60 ANALYZER and for the DTSC MODULE. Are these values available?



Advance to step 21.



Advance to step 29.

IMPORTANT

Check that you correctly enter negative signs and decimal places when you do step 21.

- [21] Execute option 81 to enter the correction factors from the customer or from the printout obtained in step 1 of the removal procedure. See the Options section.

NOTE

The correction factors for the DTSC MODULE were not deleted. It is not necessary to enter these correction factors or the reflectance values again.

- [22] Execute option 36 to obtain a printout of the correction factors entered in step 21. Compare this printout with the existing printout.
- [23] If necessary, do steps 21 and 22 again to obtain the correct values.

IMPORTANT

Check that you enter the correct calibration level and generation number when you do step 24.

- [24] Execute option 32 to enter the calibration parameters obtained from the customer or from the printout in step 2 of the removal procedure. See the Options section.
- [25] Compare the printout obtained in step 24 with the existing printout.
- [26] If necessary, do steps 24 and 25 again to obtain the correct values.
- [27] Process Kodak Ektachem CONTROLS for all tests used by the customer to check that the calibration is correct.

NOTE

If necessary, see "Preparing the Controls" and "Analyzing the Controls" in the section "Quality Control Testing", and see the section "Operating Instructions" in the Operator's Manual.

- [28] Are the values for the test results within the correct ranges for all CONTROLS?



The procedure is completed.



Advance to step 29.

- [29] If the ANALYZER has software version 11.0, execute option 29 to calculate the new correction factors. See the Options section.
- [30] The ANALYZER must be calibrated for all tests used by the customer. Process Kodak Ektachem CONTROLS to check that the calibration is correct.

IMPORTANT

If a Kodak employee calibrates the ANALYZER, a CALIBRATION LABEL, publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.

Voltage specifications for the TEST PADS

TP10	Ground
TP2	+14.5 V dc to +15.5 V dc, POWER SUPPLY
TP4	+11.4 V dc to +12.6 V dc, SD - SBDT derived
TP5	+11.4 V dc to +12.6 V dc, ANALOG - SBDT
TP6	+4.85 V dc to +5.15 V dc, POWER SUPPLY
TP7	-11.4 V dc to -12.6 V dc, SBDT derived
TP8	-14.5 V dc to -15.5 V dc, POWER SUPPLY
TP9	-4.75 V dc to -5.25 V dc, SBDT derived
TP11	+11.0 V dc to +13.0 V dc, POWER SUPPLY ACT

Adjustment specification for the PRINTER - Character Density

Using paper available from Kodak, the 4 dots in the "." character must be separate. The 4 dots are visible through MAGNIFIER TL-1442.

POTENTIOMETER:

VR101, on the PRINTER INTERFACE BOARD.

Clockwise rotation increases density. Adjust the density of the printout to a maximum of 100 microseconds. See the illustration in the adjustment procedure.

Adjustment specifications for the LC DISPLAY

The characters on the LC DISPLAY should have optimum contrast and be easy to read.

POTENTIOMETER:

R80 on the DRIVER BOARD for the Multi-Board configuration.

R76 on the MASTER BOARD for the Single-Board configuration.

Adjustment specification for the voltage of the BAR CODE READER -
Multi-Board Configuration

Insert the BAR CODE SLIDE TL-3482 with the white surface up.
If the TAB on the BAR CODE READER is toward the left of the ANALYZER, the voltage should be -5.25 to -5.75 V dc.
If the TAB on the BAR CODE READER is toward the back of the ANALYZER, the voltage should be -4.25 V dc to -4.75 V dc.

TEST POINTS:

MULTIMETER TL-3424	
+	-
TP5 on the DRIVER BOARD	TP1 on the MOTHER BOARD

POTENTIOMETER: R47 on the DRIVER BOARD

Adjustment specification for the voltage of the BAR CODE READER -
Single-Board Configuration

Both surfaces of the BAR CODE SLIDE TL-3482 should be used.
The voltage reading for the white reflectance surface should be adjusted to approximately -10.0 V dc.
The minimum difference between the voltage readings for the black reflectance and the white reflectance must be 4.5 V or more.
The BAR CODE READER must be able to identify slides correctly inserted at fast and slow insertion speeds.

TEST POINTS:

MULTIMETER TL-3424	
+	-
TP14	TP10

POTENTIOMETER: R108 on the MASTER BOARD

Adjustment specification for the SPOT DETECTOR SENSOR
+5.50 to +6.00 V dc

TEST POINTS:

For the Multi-Board Configuration

MULTIMETER TL-3424	
+	-
TP4 on the DRIVER BOARD	TP1 on the MOTHER BOARD

For the Single-Board Configuration

MULTIMETER TL-3424	
+	-
TP3 on the MASTER BOARD	TP10 on the MASTER BOARD

POTENTIOMETER:

R32 on the DRIVER BOARD for the Multi-Board Configuration
R35 on the MASTER BOARD for the Single-Board Configuration

Adjustment specification for the temperature of the INCUBATOR

The calculated average of 3 high and 3 low temperatures measured at the Spotting Station must be 36.7 to 37.3°C (98 to 99°F).

POTENTIOMETER:

R58 on the DRIVER BOARD for the Multi-Board configuration
R73 on the MASTER BOARD for the Single-Board configuration

031576 - 343943

Part No.	Description	Page No.
031576	Nut - Hex, 8-32 UNC-2B x 11/32.....	77
054847	Washer - Plain, 0.4375 OD x 0.1875 ID x 0.049 Th.....	13, 59
055850	Washer - Lock, Type A, No. 8.....	77
090606	Washer - Plain, No. 4.....	59
095533	Washer - Plain, 0.375 OD x 0.156 ID x 0.049 Th.....	12, 67
120776	Screw - Mach, PHILLIPS, flat hd, 4-40 UNC-2A x 5/16.....	77
122719	Screw - Mach, PHILLIPS, pan hd, 4-40 UNC-2A x 1/4.....	17, 37
122720	Screw - Mach, PHILLIPS, pan hd, 4-40 UNC-2A x 5/16.....	33
122754	Screw - Mach, PHILLIPS, pan hd, 8-32 UNC-2A x 1/4.....	21
122767	Screw - Mach, PHILLIPS, pan hd, 10-32 UNF-2A x 1.....	11
128531	Washer - Plain, 0.250 OD x 0.125 ID x 0.022 Th.....	17, 19
131492	Screw - Mach, pan hd, 2-56 UNC-2A x 5/16.....	13
132927	Fuse - Standard Blow, 3 A, 250 V.....	83
136218	Nut - Hex, 4-40 UNC-2B x 1/4.....	17
140144	Washer - Plain, Type A, No. 4.....	39
141537	Screw - Set, hex, plastic tip, 4-40 UNC-3A x 1/4.....	65
155010	Washer - Plain, No. 8.....	19
157529	O-Ring - Rubber, 0.070 OD x 0.176 ID.....	11
158943	Screw.....	77
169769	Screw.....	39
173407	Screw - Set, hex, 4-40 UNC-3A x 3/8.....	33, 43
173599	Screw - SEMS, PHILLIPS, 6-32 x 1/4.....	77
173773	Screw - Mach, PHILLIPS, pan hd, 4-40 UNC-2A x 1/2.....	23
178107	Screw - Mach, pan hd, 4-40 UNC-2A x 5/16.....	33
179061	Screw - Mach, pan hd, slotted, UNC-2A x 1/4.....	18, 47, 52
179713	Nut - Hex, 4-40 UNC-2B.....	33
182590	Wrap - Tie.....	27, 33

Part No.	Description	Page No.
188828	Washer - Lock, spring, 0.209 OD x 0.115 ID x 0.025 Th.....	33, 61
200475	Screw - Mach, PHILLIPS, pan hd, 2-56 UNC-2A x 3/8.....	77
227322	Battery.....	91
263091	Cord - Power, United Kingdom.....	17
337353	Integrated Circuit.....	89
337554 (D)	Cord - Power, Europe, Australia.....	17
337566	Filter - EMI.....	81
337842	Screw - SEMS, mach, PHILLIPS, pan hd, 4-40 UNC-2A x 5/8.....	23
338650	Platen - Floating.....	51
340360	Spring - Sensor.....	59
340366	Roller- Printer.....	77
340377	Clamp - Cable.....	33
340379	Door - CLM Access.....	17
340391	Pad - Foam.....	17
340999	Label - Caution.....	77
342567	Overlay - Keyboard, German.....	21
342576	Overlay - Keyboard, Italian.....	21
342577	Overlay - Keyboard, French.....	21
343868	Clamp - Stripper.....	51
343878	Thermistor Assembly.....	71
343879	Cover Switch Assembly.....	13
343881	Heater Rod Assembly.....	71
343882	Sensor - Spot Detector.....	47
343884	Guide - Circuit board.....	12
343937	I/O Circuit Board Assembly - Version 9.0 software.....	15, 89
343942	Strap - Chassis ground.....	13
343943	Strap - Stepper ground.....	13

344220 - 372056

Part No.	Description	Page No.
344220	Screw - Jack.....	39
344248	Label - CDM/CLM.....	17
344282	Pin.....	43, 51
345257	Incubator Chamber Cover Assembly.....	39
345280	Stem - Clip.....	55
345282	Baffle.....	77
345284	Pressure Pad Assembly, Type 2.....	55
350204	Spring - Overshoot.....	61, 65
350227	LC Display.....	21
350246	Bar Code Reader.....	39
350247	Sensor - Home/Slide.....	33, 59
350295	Pressure Pad Assembly, Type 1.....	51
350407	Overlay - Keyboard, Japanese.....	21
351449	Cable - Jumper.....	16
351572	Adapter Box Assembly.....	15, 17, 19
351698	Plug - Access.....	19
352387	Driver Circuit Board Assembly.....	15, 90
352397	FORS Weight Shroud Assembly.....	33
352398	Guard - FORS.....	25
352399	CDM/CLM Circuit Board Assembly - Version 10.7 software and above.....	15, 87
352406	Overlay - Keyboard, Spanish.....	21
352413	Arm - Upper.....	43
352414	Heater Harness Assembly.....	16, 33
352415	Guard - Printer.....	77
352421	Lock - Boot light.....	17
352422	Bar - Nut.....	17
352430	Support - Printer.....	77

Part No.	Description	Page No.
352434	Lower Rack Assembly.....	61
352447	Tip Seat - Pipette.....	11
352473	FORS Head with Circuit Board Assembly.....	29
352487	CPU Circuit Board Assembly.....	15, 88
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352520	I/O Circuit Board Assembly - Version 10.7 software and above.....	15, 89
352531	Incubation Chamber - Lower.....	65, 71
352536	Fan Assembly.....	77
352543	Lower Rack Assembly - Modification No. M6.....	61
352569	Cover - Pipette locator.....	23
352570	Housing - Pipette locator.....	51
352605	Spring - Pressure pad, 0.013 diameter.....	55
352606	Arm - Lower.....	65
352616	CPU Circuit Board Assembly - Version 10.7 software.....	15, 88
352637	Spring - FORS sensor.....	33, 35
352652	Cup - Disposal.....	11
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793712	Screw - SEMS, mach, PHILLIPS, 8-32 UNC-2A x 1/4.....	13, 59, 67
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Customer Equipment Services

EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650

06-88
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10/87
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Kodak Ektachem DTE MODULE

Parts/Removals Section 11

PLEASE NOTE

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• CAUTION •
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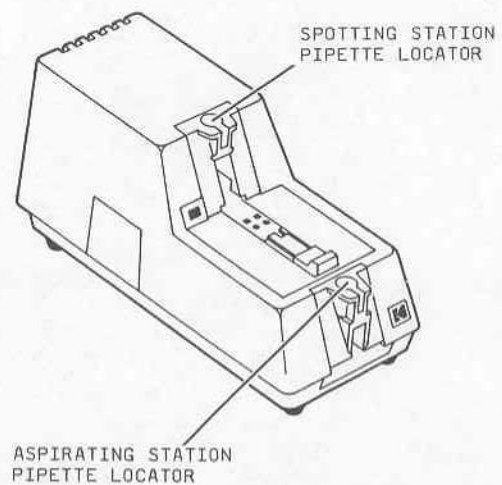


This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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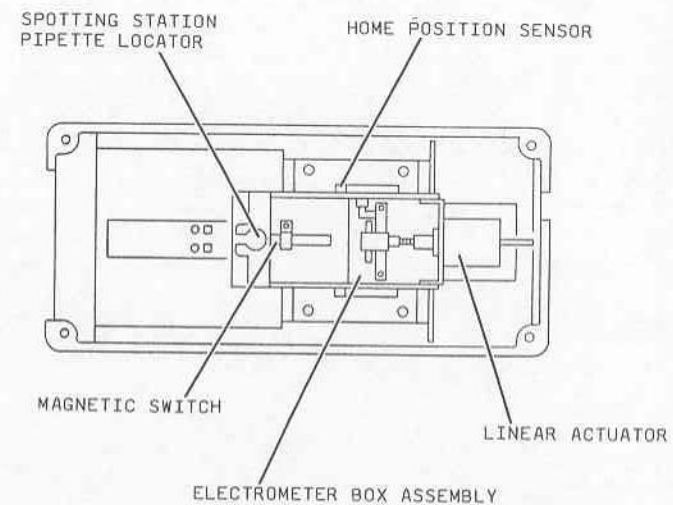
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With COVER
XP3100-11

11-1

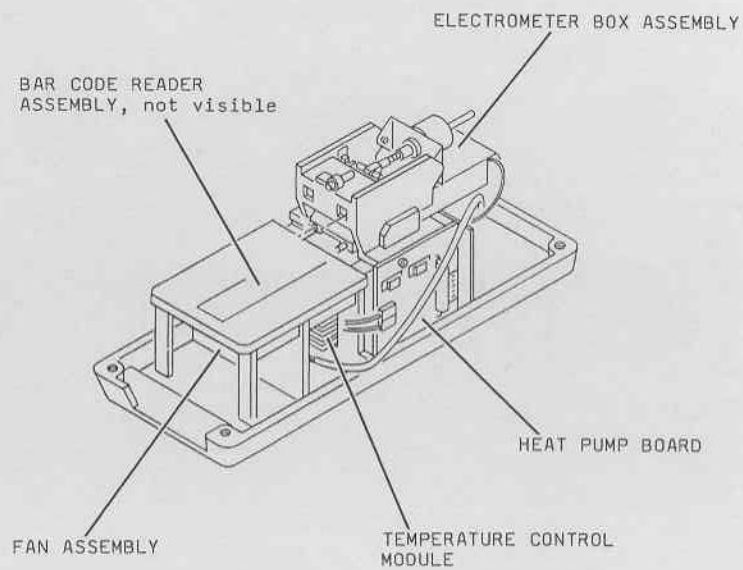
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Top
XP3100-11

11-2

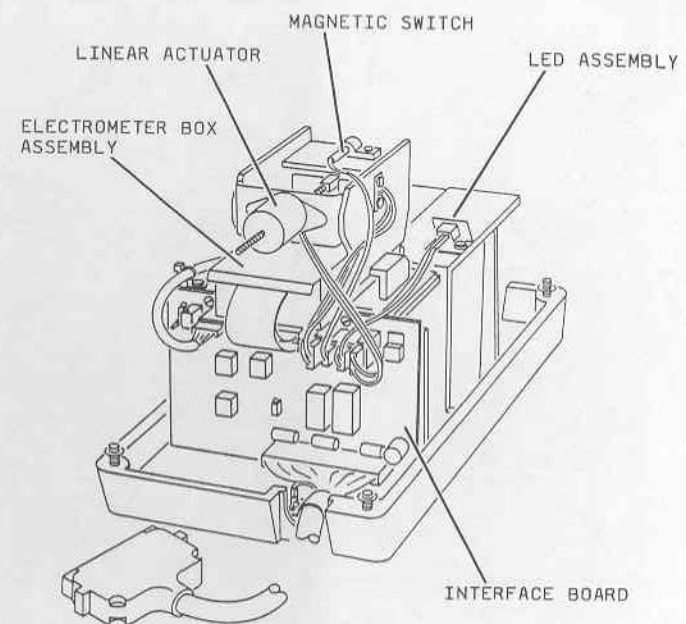
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Right side
XP3100-11

11-3

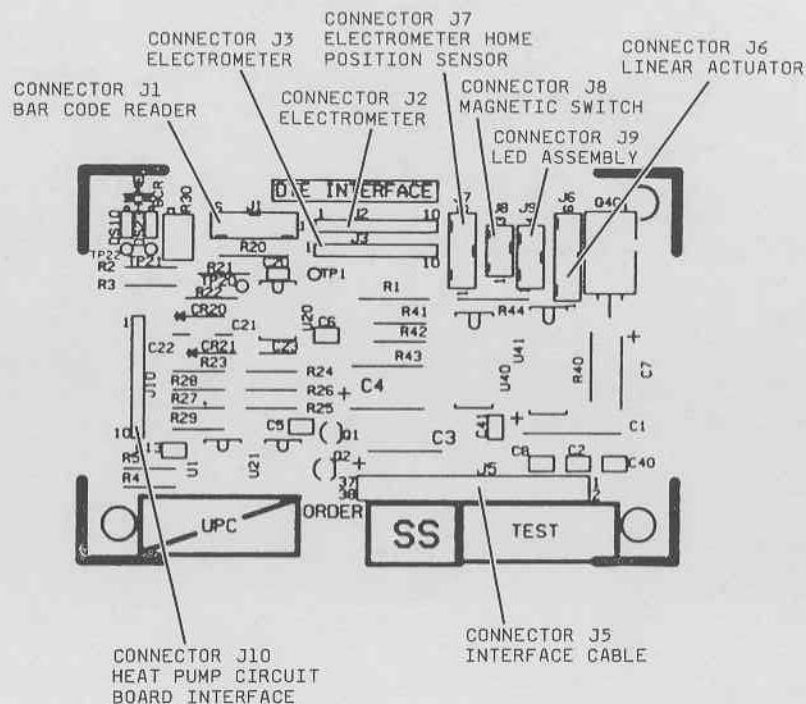
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Back
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11-4

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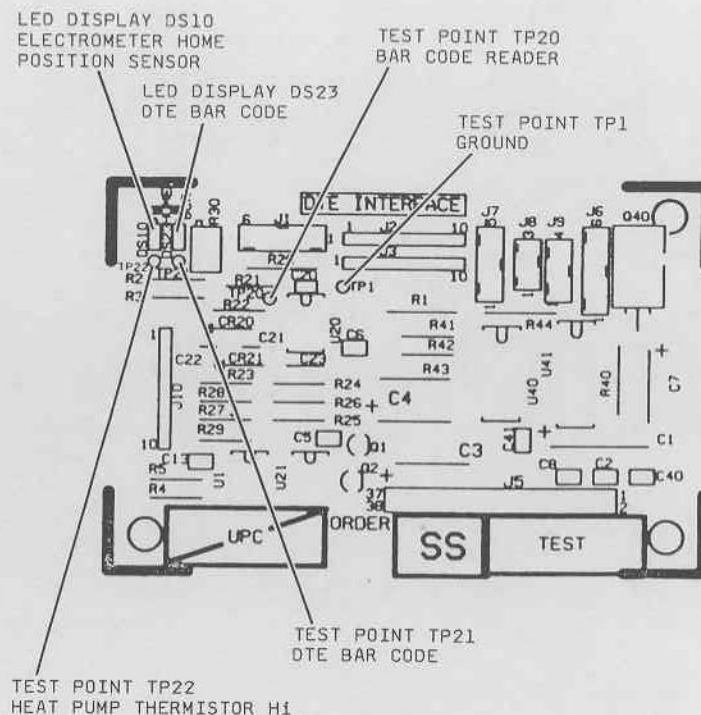


Positions of the CONNECTORS on the Type 2 INTERFACE BOARD

XP3100-11

11-7

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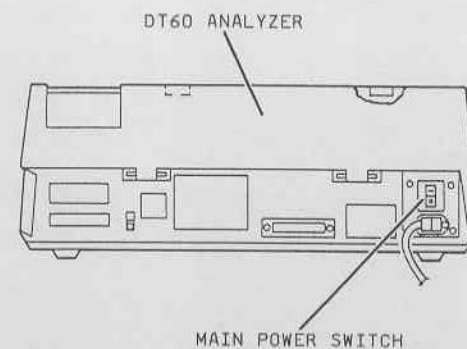
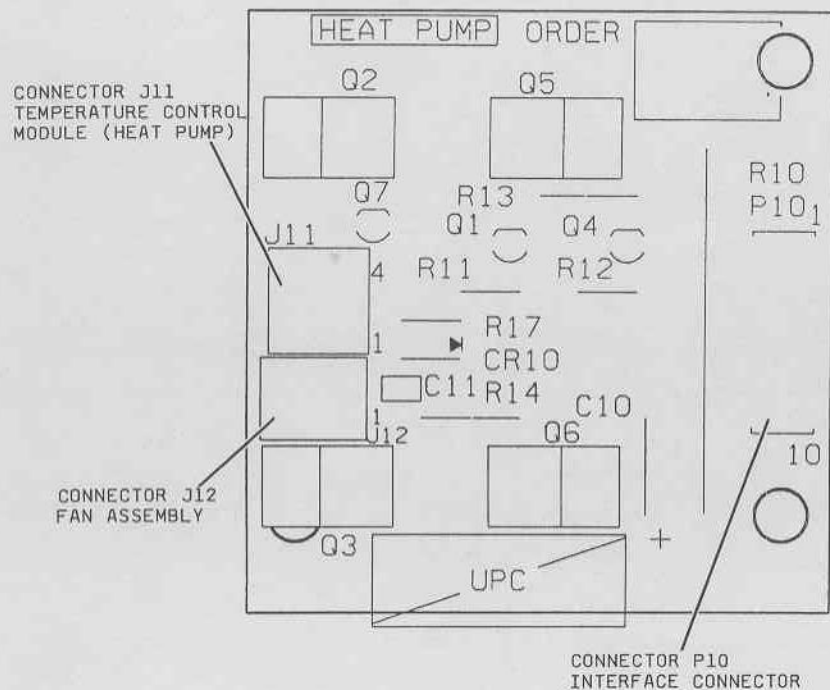


Positions of the LED DISPLAYS and TEST POINTS on the Type 2 INTERFACE BOARD

XP3100-11

11-8

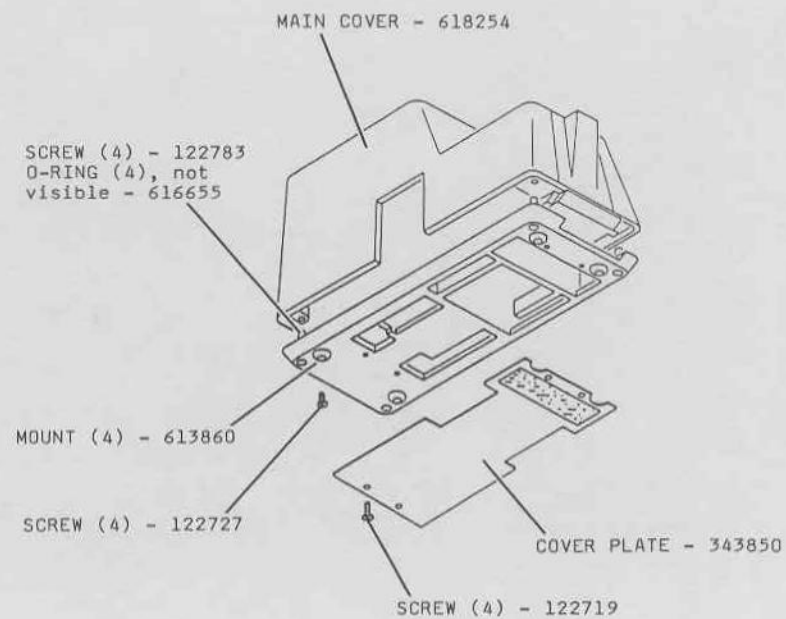
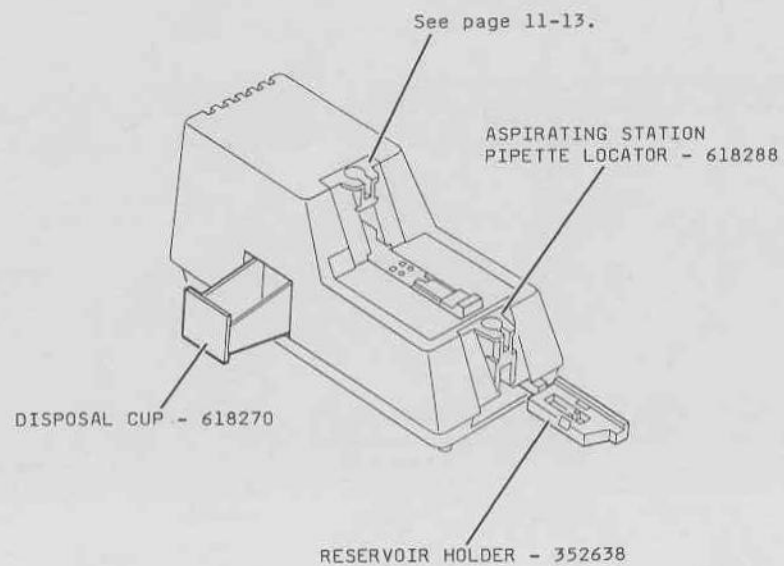
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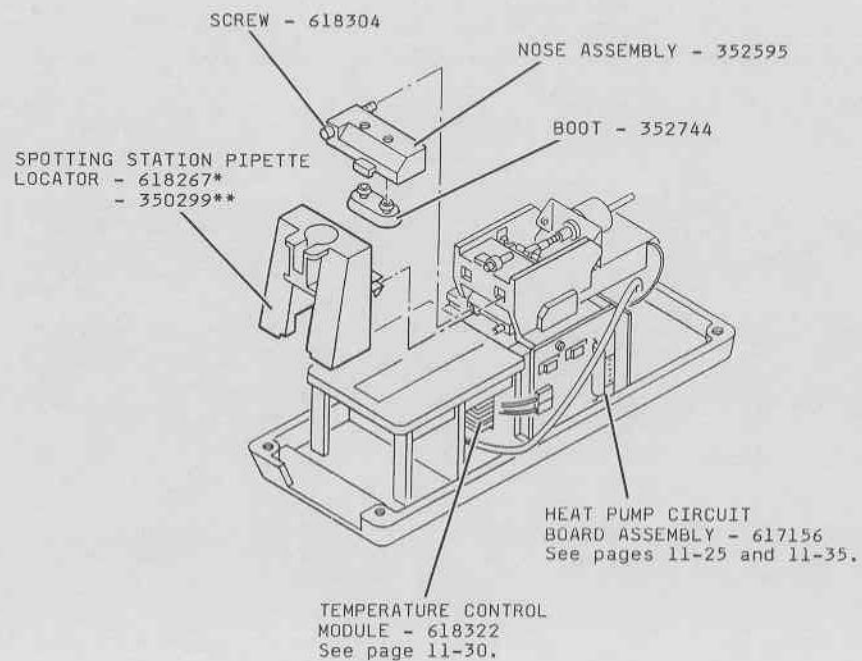
Move the MAIN POWER SWITCH of the DT60 ANALYZER to the "0" position before doing any removal procedure.

Move the MAIN POWER SWITCH to the "1" position after all the parts are installed.

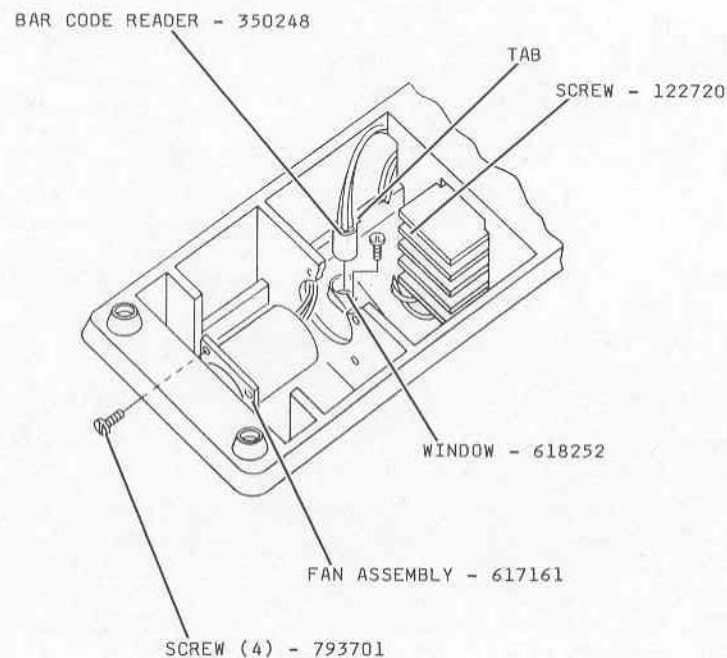
Positions of the CONNECTORS on the HEAT PUMP BOARD



Remove the MAIN COVER before doing any removal procedure.
Install the MAIN COVER after the parts are installed.



* Serial-number 60001542 and below.
 ** Serial-number 60001543 and above.



To remove the BAR CODE READER

- [1] Remove the COVER PLATE. See page 11-12.
- [2] Place the DTE MODULE upside down.
- [3] Remove the 4 SCREWS 793701 and pull the FAN ASSEMBLY toward the front.
- [4] Remove the SCREW 122720 and the BAR CODE READER.
- [5] Disconnect CONNECTOR J1 on the INTERFACE BOARD. See page 11-5 or 11-7.

Adjustment specifications for the BAR CODE READER - Voltage

-5.25 to -5.75 V dc with the BAR CODE SLIDE TL-3482

Test Points

INTERFACE BOARD

MULTIMETER TL-3424	
+	-
TP20	TP1

POTENTIOMETER: R30 on the INTERFACE BOARD

To install

IMPORTANT

The BAR CODE READER must be fully seated in the hole.

The TAB on the BAR CODE READER must be toward either the front or the back of the DTE MODULE.

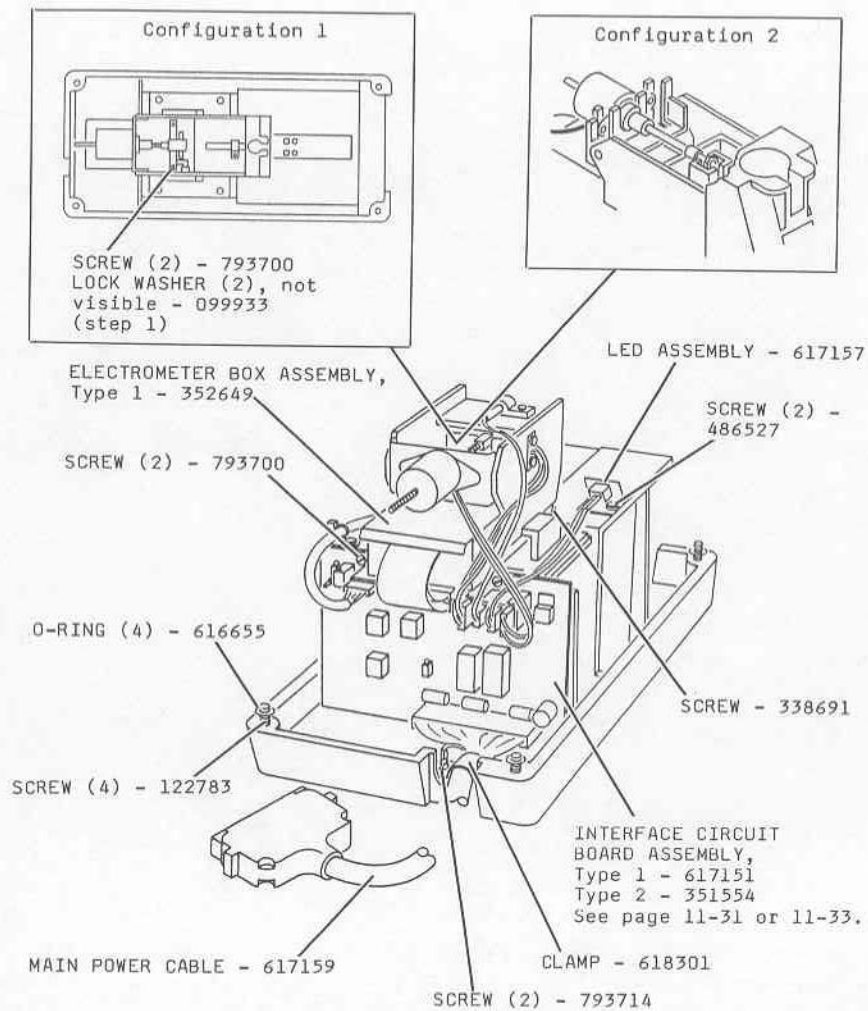
- [1] Install the parts in the reverse order.
- [2] Check that the voltage adjustment for the BAR CODE READER is correct.

To remove the FAN ASSEMBLY

- [1] Remove the 4 SCREWS 793701.
- [2] Disconnect CONNECTOR J12 on the HEAT PUMP BOARD. See page 11-25.
- [3] Pull out the FAN ASSEMBLY.

To install

Install the parts in the reverse order.



To remove the Type 1 ELECTROMETER BOX ASSEMBLY

- [1] Remove:
 - PIPETTE LOCATOR, see page 11-13
 - 2 SCREWS 793700 and 2 LOCK WASHERS 099933
 - SCREW 338691
- [2] Disconnect CONNECTORS J2 and J3 on the INTERFACE BOARD. See page 11-5 or 11-7.

.....
 • CAUTION •

Do not cause damage to the CONTACTS.

- [3] Pull the ELECTROMETER out from the back.
- [4] Loosen the SCREW 618304 and remove the NOSE ASSEMBLY. See page 11-13.

To install

- [1] Install the NOSE ASSEMBLY on the new ELECTROMETER.

.....
 • CAUTION •

Do not cause damage to the CONTACTS.

- [2] Install the parts in the reverse order.
- [3] Check that the following procedures are correct:

Adjustment
HOME POSITION SENSOR
ELECTROMETER CONTACTS -
Compression
Contact Verification Test

Adjustment specifications for the HOME POSITION SENSOR

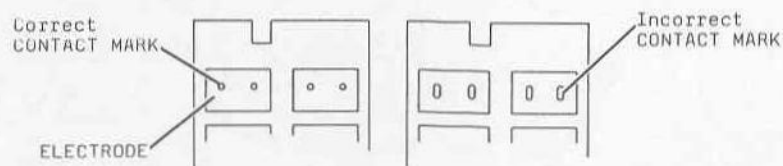
The SENSOR must be in the position that allows the FLAG to enter the SENSOR within the step count determined by the software and the NOSE ASSEMBLY does not obstruct the TIPS.

Error code F20 does not occur when option 42 is entered for 2 cycles.

Adjustment specifications for the ELECTROMETER CONTACTS - Compression

When a slide is in the Spotting Station, the ELECTROMETER CONTACTS should compress 0.75 to 1.0 mm (0.03 to 0.04 in.).

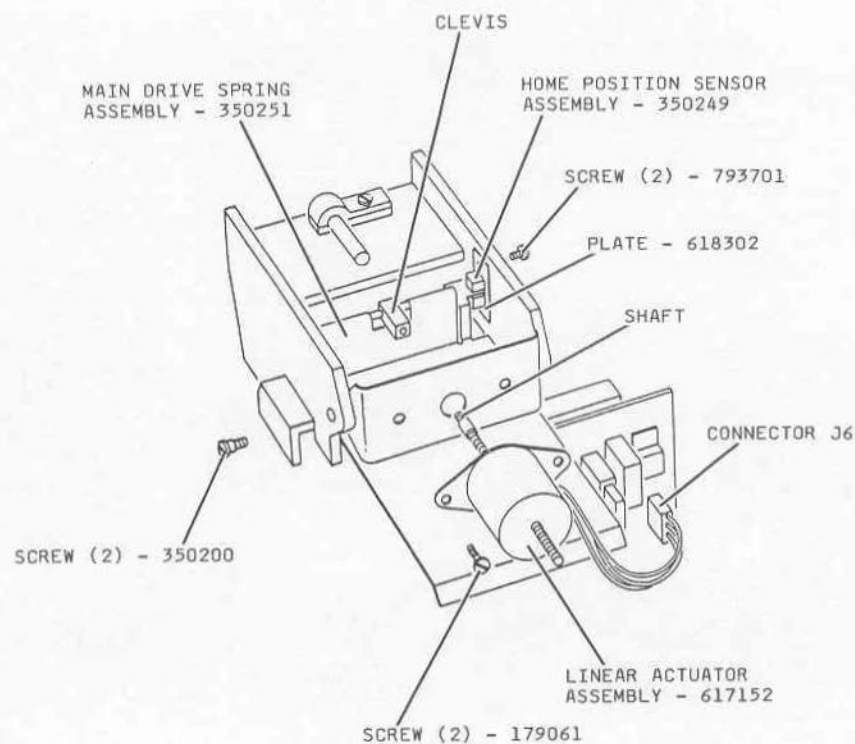
When the compression is adjusted correctly, the 4 CONTACTS should puncture the ELECTRODES on the slide and make 4 small holes in the emulsion. These holes should be visible using MAGNIFIER TL-1442 when the slide is placed in front of a light source. The ELECTRODES should not be scratched adjacent to the punctured holes. See the illustrations for examples of CONTACT MARKS that are correct and not correct.



The result of the Contact Verification Test should be a "MV" value of -5.0 to +5.0. If necessary, see the procedure in the adjustments section for the DTE MODULE.

Specification for the Contact Verification Test

The "MV" value on the printout when REFERENCE FLUID is used in both DROP WELLS of the slide for a potentiometric test should be -5.0 mV to +5.0 mV.

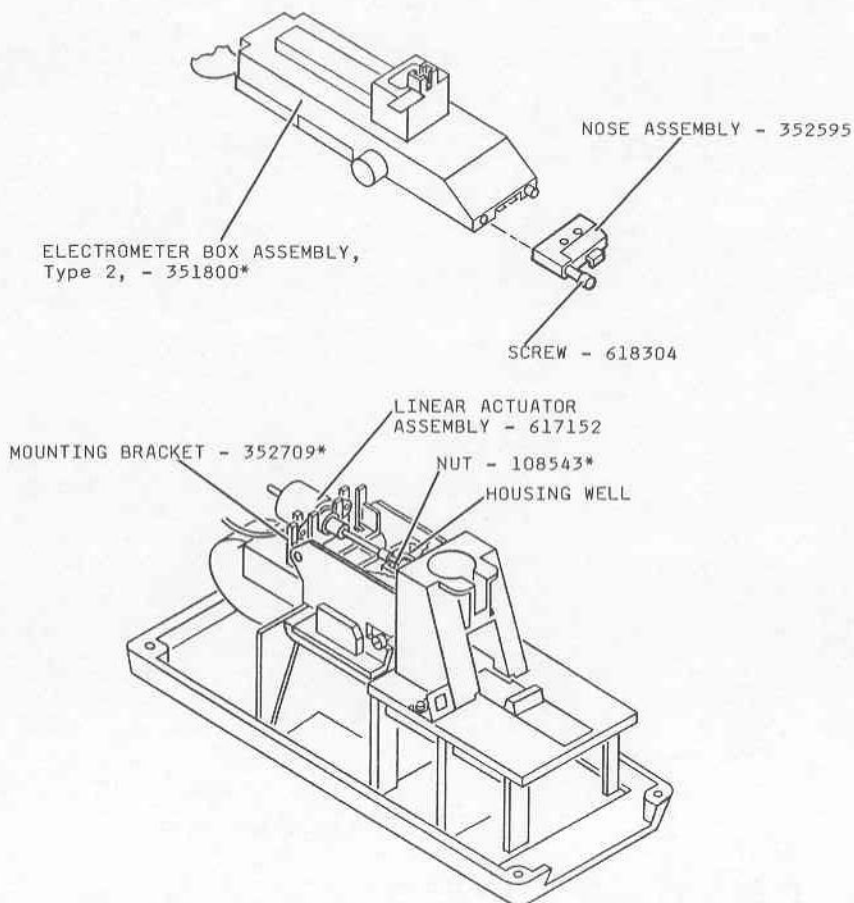


To remove the Configuration 1 LINEAR ACTUATOR

- [1] Disconnect CONNECTOR J6 on the INTERFACE BOARD. See page 11-5 or 11-7.
- [2] Remove the 2 SCREWS 179061.
- [3] Rotate the SHAFT counterclockwise until it is removed from the CLEVIS.
- [4] Remove the LINEAR ACTUATOR.

To install

Install the parts in the reverse order.



* Included in the ELECTROMETER ASSEMBLY, Type 2, PARTS KIT 352751.

To remove the Configuration 2 LINEAR ACTUATOR

- [1] Disconnect CONNECTOR J6 on the INTERFACE BOARD. See page 11-5 or 11-7.
- [2] Disengage and lift the LINEAR ACTUATOR from the MOUNTING BRACKET and the HOUSING WELL.

To install

IMPORTANT

If you are installing the Configuration 2 LINEAR ACTUATOR, for the first time, see the instructions packed with the parts.

Install the parts in the reverse order.

To remove the Type 2 ELECTROMETER BOX ASSEMBLY

- [1] Remove the PIPETTE LOCATOR. See page 11-13.
- [2] Disconnect CONNECTORS J2 and J3 on the INTERFACE BOARD. See page 11-5 or 11-7.

.....
• CAUTION •
.....

Possible damage from electrostatic discharge.

Do not cause damage to the CONTACTS.

- [3] Remove the LINEAR ACTUATOR MOUNTING BRACKET with the LINEAR ACTUATOR.

- [4] Pull the ELECTROMETER out from the back.

- [5] Loosen the SCREW 618304 and remove the NOSE ASSEMBLY.

To install

.....
• CAUTION •
.....

Possible damage from electrostatic discharge.

IMPORTANT

If you are installing the Type 2 ELECTROMETER BOX ASSEMBLY, for the first time, see the instructions packed with the parts.

- [1] Install the NOSE ASSEMBLY on the new ELECTROMETER.

.....
• CAUTION •
.....

Do not cause damage to the CONTACTS.

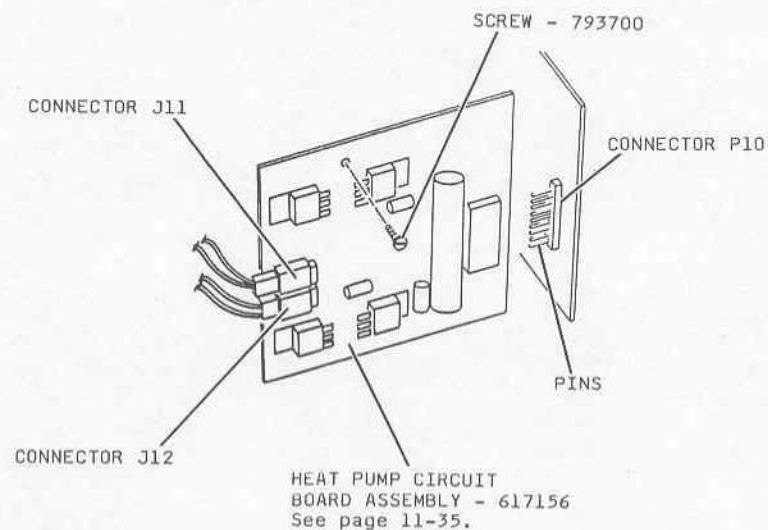
- [2] Install the parts in the reverse order.

- [3] Check that the adjustment for the HOME SENSOR is correct.

Adjustment specification for the HOME SENSOR

- The SENSOR must be in the position that allows the FLAG to enter the SENSOR within the step count determined by the software and the NOSE ASSEMBLY of the ELECTROMETER does not obstruct the TIPS.

- Error code F20 does not occur.



To remove the HEAT PUMP BOARD

.....
: CAUTION :
.....

Possible damage from electrostatic discharge.

- [1] Disconnect CONNECTORS J11 and J12.
- [2] Remove the SCREW 797300.

.....
: CAUTION :
.....

Do not cause damage to the PINS on CONNECTOR P10.

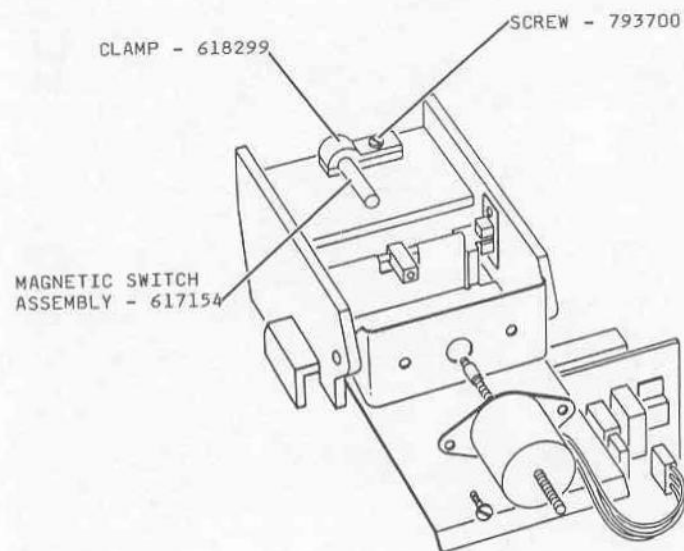
- [3] Move the HEAT PUMP BOARD toward the front of the DTE MODULE to disconnect CONNECTOR P10.
- [4] Remove the HEAT PUMP BOARD.

To install

.....
: CAUTION :
.....

Do not cause damage to the PINS on CONNECTOR P10.

Install the parts in the reverse order.



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XP3100-11

To remove the MAGNETIC SWITCH

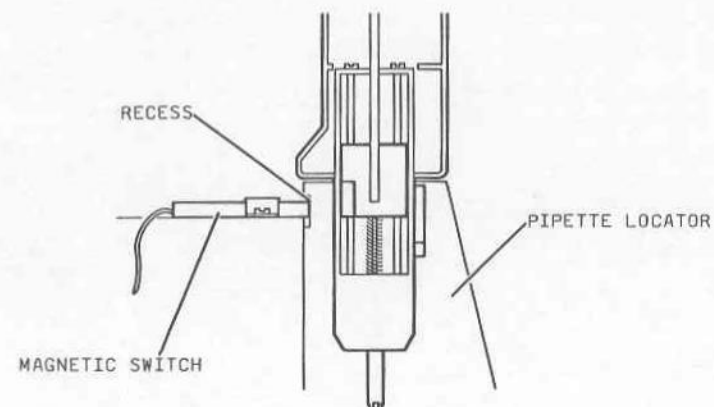
- [1] Disconnect CONNECTOR J8 on the INTERFACE BOARD. See page 11-5 or 11-7.
- [2] Loosen the SCREW 793700.
- [3] Remove the MAGNETIC SWITCH.

To install

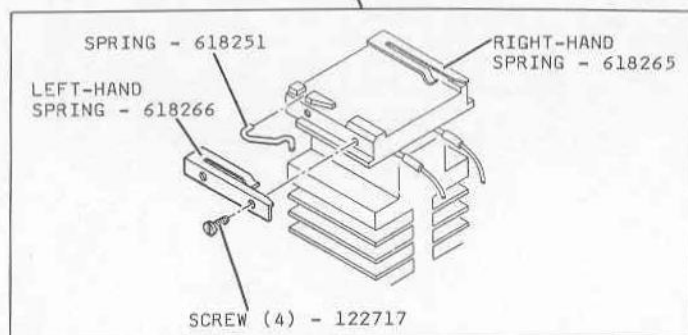
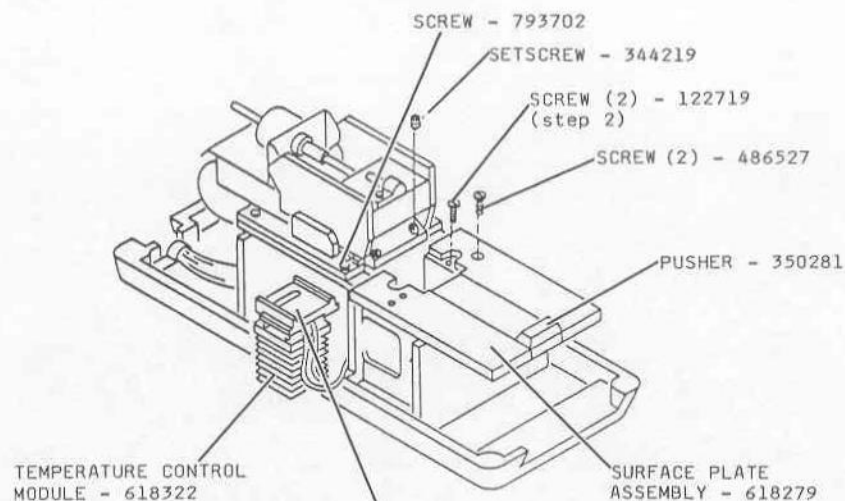
Install the parts in the reverse order.

Specification for the MAGNETIC SWITCH

The front of the MAGNETIC SWITCH should be flush with the PIPETTE LOCATOR.



11-28



To remove the TEMPERATURE CONTROL MODULE

- [1] Execute option 41 to move the ELECTROMETER to the home-position.
- [2] Remove:
 - DISPOSAL CUP, see page 11-11
 - PIPETTE LOCATOR, see page 11-13
 - NOSE ASSEMBLY, see page 11-13
- [3] Loosen the 2 SCREWS 122719.
- [4] Disconnect CONNECTOR J11 from the HEAT PUMP BOARD. See page 11-35.

.....
: CAUTION :
.....

Do not cause damage to the CONTACTS.

- [5] Move the TEMPERATURE CONTROL MODULE toward the back of the DTE MODULE and down.
- [6] Remove the TEMPERATURE CONTROL MODULE.

To install

.....
: CAUTION :
.....

Do not cause damage to the CONTACTS.

Install the parts in the reverse order.

- | Procedure |
|----------------------------|
| Reference and Offset Test |
| BAR CODE READER Adjustment |

- ### Specifications for the Reference and Offset Test

- within the range of -1500 to -1700 A/D units
- within 6 A/D units of each other

Adjustment specifications for the BAR CODE READER - Voltage

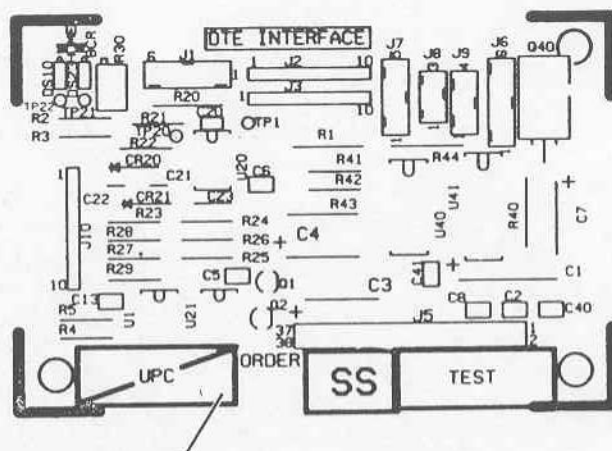
Test Points

MULTIMETER TL-3424	
+	-
TP20	TP1

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Type 2 INTERFACE CIRCUIT BOARD ASSEMBLY -351554

- [1] Do the following procedures after installing a new Type 2 INTERFACE CIRCUIT BOARD ASSEMBLY:

Procedure
Reference and Offset Test
BAR CODE READER Adjustment

- [2] Execute option 44 to do the Temperature Test. See the Options section.

Specifications for the Reference and Offset Test

After processing 3 potentiometric slides, the values should be:

- "REF" values
- within the range of -1500 to -1700 A/D units
 - within 6 A/D units of each other
- "OFST" values
- within the range of -50 to +50 A/D units
 - within 6 A/D units of each other

Adjustment specifications for the BAR CODE READER - Voltage

-5.25 to -5.75 V dc with the BAR CODE SLIDE TL-3482

Test Points

INTERFACE BOARD

MULTIMETER TL-3424	
+	-
TP20	TP1

POTENTIOMETER: R30 on the INTERFACE BOARD



099933 — 618288

Part No.	Description	Page No.
099933	Washer - Plain, 0.116 ID x 0.218 OD x 0.020 Th.....	17
108543	Nut - Hex head, 4-40.....	23
122717	Screw - Mach, PHILLIPS, pan head, 4-40 UNC-2A x 3/16.....	29
122719	Screw - Mach, PHILLIPS, pan head, 4-40 UNC-2A x 1/4.....	12,29
122720	Screw - Mach, PHILLIPS, pan head, 4-40 UNC-2A x 5/16.....	15
122727	Screw.....	12
122783	Screw - Cap, hex socket hd, 8-32 x 1/2.....	12,17
179061	Screw - Mach, pan hd, slotted, 4-40 x 1/4.....	21
338691	Screw - Shoulder.....	17
343850	Plate - Cover.....	12
344219	Screw - Set, SST, 4-40 x 5/8.....	29
350200	Screw - Shoulder.....	21
350248	Bar Code Reader.....	15
350249	Home Position Sensor Assembly.....	21
350251	Main Drive Spring Assembly.....	21
350281	Pusher - Manual.....	29
350299	Locator - Spotting station pipette.....	13
351554	Interface Circuit Board Assembly, Type 2.....	17,33
351800	Electrometer Box Assembly, Type 2.....	23
352595	Nose Assembly.....	13,23
352638	Holder - Reservoir.....	11
352649	Electrometer Box Assembly, Type 1.....	17

Part No.	Description	Page No.
352709	Bracket - Mounting.....	23
352744	Boot - Incubation.....	13
352751	Electrometer Assembly, Type 2, Parts Kit.....	23
486527	Screw.....	17,29
613860	Mount - Rubber.....	12
616655	O-Ring.....	12,17
617151	Interface Circuit Board Assembly, Type 1.....	17,31
617152	Linear Actuator Assembly.....	21,23
617154	Magnetic Switch Assembly.....	27
617156	Heat Pump Circuit Board Assembly.....	13,25,35
617157	LED Assembly.....	17
617159	Cable - Main Power.....	17
617161	Fan Assembly.....	15
618251	Spring - Slide loading.....	29
618252	Window - Bar code reader.....	15
618254	Cover - Main.....	12
618265	Spring - Right-hand.....	29
618266	Spring - Left-hand.....	29
618267	Locator - Spotting station pipette.....	13
618270	Cup - Disposal.....	11
618279	Surface Plate Assembly.....	29
618288	Locator - Aspirating station pipette.....	11

618299 — 793714

Part No.	Description	Page No.
618299	Clamp - Sensor.....	27
618301	Clamp - Cable.....	17
618302	Plate - Sensor mounting.....	21
618304	Screw - Retaining.....	13,23
618322	Temperature Control Module.....	13,29
793700	Screw - SEMS, mach, PHILLIPS, hex head, 4-40 UNC-2A x 1/4.....	17,25,27
793701	Screw - SEMS, mach, PHILLIPS, hex head, 4-40 UNC-2A x 5/16.....	15,21
793702	Screw - SEMS, mach, PHILLIPS, hex head, 4-40 UNC-2A x 3/8.....	29
793714	Screw - SEMS, mach, PHILLIPS, hex head, 8-32 UNC-2A x 3/8.....	17

Bar — Scr

Part No.	Description	Page No.
350248	Bar Code Reader.....	15
352744	Boot - Incubation.....	13
352709	Bracket - Mounting.....	23
617159	Cable - Main Power.....	17
618301	Clamp - Cable.....	17
618299	Clamp - Sensor.....	27
618254	Cover - Main.....	12
618270	Cup - Disposal.....	11
352751	Electrometer Assembly, Type 2, Parts Kit.....	23
351800	Electrometer Box Assembly, Type 2.....	23
352649	Electrometer Box Assembly, Type 1.....	17
617161	Fan Assembly.....	15
617156	Heat Pump Circuit Board Assembly.....	13,25,35
352638	Holder - Reservoir.....	11
350249	Home Position Sensor Assembly.....	21
351554	Interface Circuit Board Assembly, Type 2.....	17,33
617151	Interface Circuit Board Assembly.....	17,31
617157	LED Assembly.....	17
617152	Linear Actuator Assembly.....	21,23
618288	Locator - Aspirating station pipette.....	11
350299	Locator - Spotting station pipette.....	13
618267	Locator - Spotting station pipette.....	13

Part No.	Description	Page No.
617154	Magnetic Switch Assembly.....	27
350251	Main Drive Spring Assembly.....	21
613860	Mount - Rubber.....	12
352595	Nose Assembly.....	13,23
108543	Nut - Hex head, 4-40.....	23
616655	O-Ring.....	12,17
343850	Plate - Cover.....	12
618302	Plate - Sensor mounting.....	21
350281	Pusher - Manual.....	29
122783	Screw - Cap, hex socket hd, 8-32 x 1/2.....	12,17
122717	Screw - Mach, PHILLIPS, pan head, 4-40 UNC-2A x 3/16.....	29
122719	Screw - Mach, PHILLIPS, pan head, 4-40 UNC-2A x 1/4.....	12,29
122720	Screw - Mach, PHILLIPS, pan head, 4-40 UNC-2A x 5/16.....	15
179061	Screw - Mach, pan hd, slotted, 4-40 x 1/4.....	21
618304	Screw - Retaining.....	13,23
793700	Screw - SEMS, mach, PHILLIPS, hex head, 4-40 UNC-2A x 1/4.....	17,25,27
793701	Screw - SEMS, mach, PHILLIPS, hex head, 4-40 UNC-2A x 5/16.....	15,21
793702	Screw - SEMS, mach, PHILLIPS, hex head, 4-40 UNC-2A x 3/8.....	29
793714	Screw - SEMS, mach, PHILLIPS, hex head, 8-32 UNC-2A x 3/8.....	17
344219	Screw - Set, SST, 4-40 x 5/8.....	29
338691	Screw - Shoulder.....	17,29
350200	Screw - Shoulder.....	21

Scr — Win

Part No.	Description	Page No.
486527	Screw.....	17,29
122727	Screw.....	12
618266	Spring - Left-hand.....	29
618265	Spring - Right-hand.....	29
618251	Spring - Slide loading.....	29
618279	Surface Plate Assembly.....	29
618322	Temperature Control Module.....	13,29
099933	Washer - Plain, 0.116 ID x 0.218 OD x 0.020 Th.....	17
618252	Window - Bar code reader.....	15

Kodak, Ektachem, DT60 and DTE are trademarks.

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Printed in USA



Publication No. XP3100-25
11/87
Supersedes: XP3100-25
5/85
XP3111-7
2/86

Kodak Ektachem DT60 ANALYZER *Kodak Ektachem* DTE MODULE *Kodak Ektachem* DTSC MODULE

Site Specifications

Section 12

PLEASE NOTE

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• CAUTION •



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Site Specifications

Kodak Ektachem DT60 ANALYZER
Kodak Ektachem DTE MODULE
Kodak Ektachem DTSC MODULE

Description	Page No.
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Specifications - DT60 ANALYZER, DTE MODULE, and DTSC MODULE.....	3, 4
Specifications - DT60 ANALYZER and DTSC MODULE.....	5, 6
Electrical and Environmental Specifications.....	7, 8

Specifications – DT60 ANALYZER and DTE MODULE

DT60 ANALYZER - Specifications

Reference	Description
A	47.6 cm (18.75 in.)
B	34.9 cm (13.75 in.)
C	17.8 cm (7.0 in.)
Weight	11.6 kg (25.6 lb)

Space Specifications
for the DT60 ANALYZER only

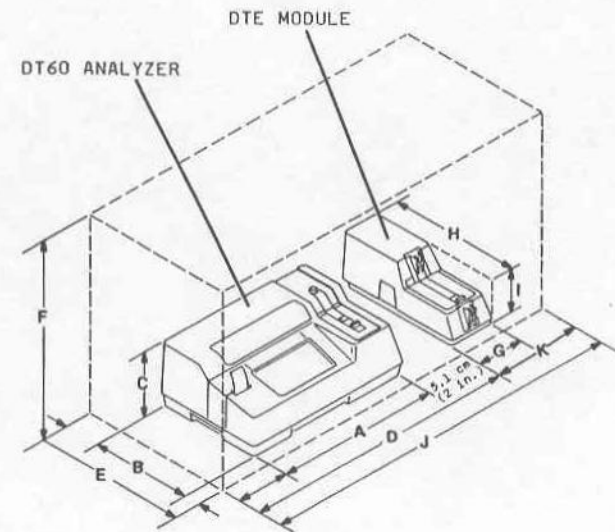
Reference	Description
D	78.7 cm (31 in.)
E	55.9 cm (22 in.)
F	48.3 cm (19 in.)

DTE MODULE - Specifications

Reference	Description
G	14.6 cm (5.75 in.)
H	35.4 cm (13.9 in.)
I	16.5 cm (6.5 in.)
Weight	3.6 kg (8.1 lb)

Space Specifications
for the DT60 ANALYZER
and the DTE MODULE

Reference	Description
E	55.9 cm (22 in.)
F	48.3 cm (19 in.)
J	109.22 cm (43 in.)
K	30.5 cm (12 in.)



Specifications – DT60 ANALYZER, DTE MODULE, and DTSC MODULE

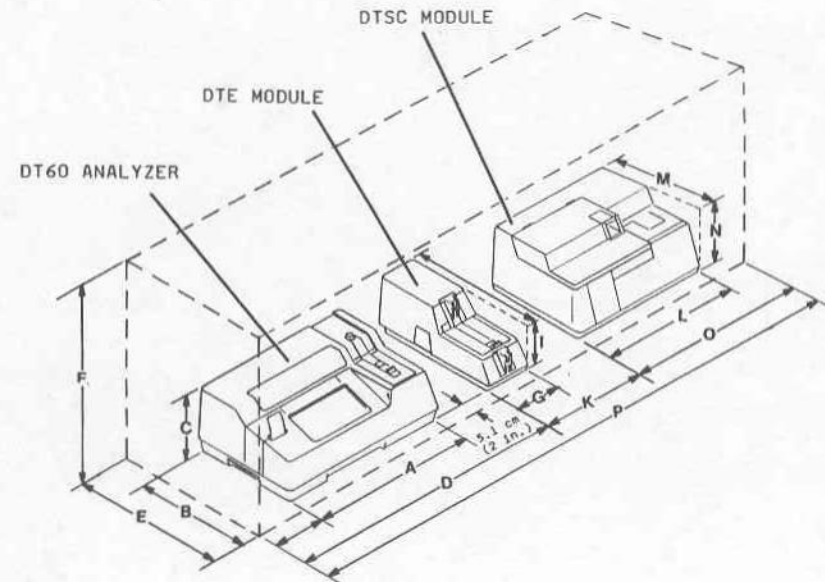
DT60 ANALYZER - Specifications	
Reference	Description
A	47.6 cm (18.75 in.)
B	34.9 cm (13.75 in.)
C	17.8 cm (7.0 in.)
Weight	11.6 kg (25.6 lb)

Space Specifications for the DT60 ANALYZER only	
Reference	Description
D	78.7 cm (31 in.)
E	55.9 cm (22 in.)
F	48.3 cm (19 in.)

DTE MODULE - Specifications	
Reference	Description
G	14.6 cm (5.75 in.)
H	35.4 cm (13.9 in.)
I	16.5 cm (6.5 in.)
Weight	3.6 kg (8.1 lb)

Space Specifications for the DT60 ANALYZER, DTE MODULE and DTSC MODULE	
Reference	Description
E	55.9 cm (22 in.)
F	48.3 cm (19.0 in.)
K	30.5 cm (12.0 in.)
O	49.5 cm (19.5 in.)
P	158.7 cm (62.5 in.)

DTSC MODULE - Specifications	
Reference	Description
L	34.3 cm (13.5 in.)
M	34.3 cm (13.5 in.)
N	18.1 cm (7.25 in.)
Weight	7.7 kg (17 lb)



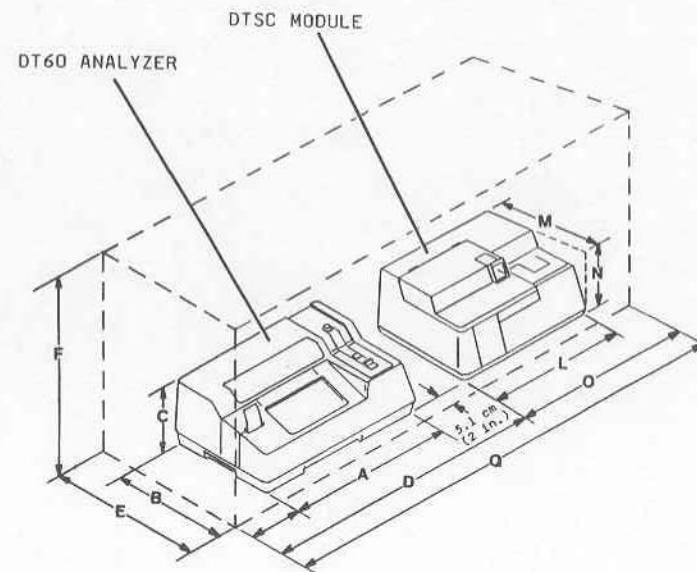
Specifications – DT60 ANALYZER and DTSC MODULE

DT60 ANALYZER - Specifications	
Reference	Description
A	47.6 cm (18.75 in.)
B	34.9 cm (13.75 in.)
C	17.8 cm (7.0 in.)
Weight	11.6 kg (25.6 lb)

Space Specifications for the DT60 ANALYZER only	
Reference	Description
D	78.7 cm (31 in.)
E	55.9 cm (22 in.)
F	48.3 cm (19 in.)

DTSC MODULE - Specifications	
Reference	Description
L	34.3 cm (13.5 in.)
M	34.3 cm (13.5 in.)
N	18.1 cm (7.25 in.)
Weight	7.7 kg (17 lb)

Space Specifications for the DT60 ANALYZER and DTSC MODULE	
Reference	Description
E	55.9 cm (22 in.)
F	48.3 cm (19 in.)
O	49.5 cm (19.5 in.)
Q	128.2 cm (50.5 in.)



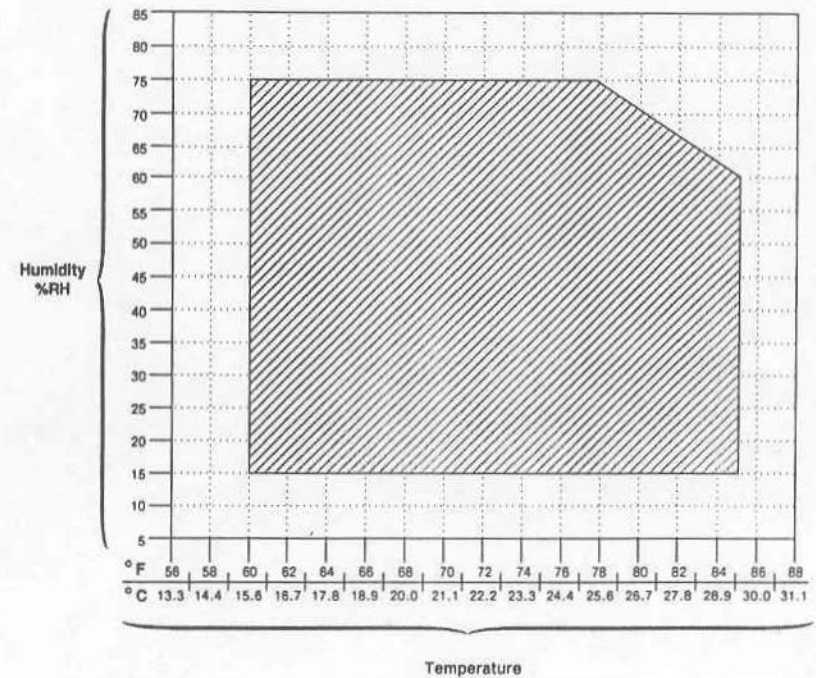
Electrical and Enviromental Specifications

Electrical Specifications	
RECEPTACLE*	3-wire, grounded.** Maximum length of the POWER CORDS is 2.4 m (8 ft).
Power	Use the MULTIMETER TL-3424 to determine the voltage.
Approximately 115 V***	Check that the voltage is 90 - 132 V ac, 50/60 Hz, 15 amperes.
Approximately 220 V****	Check that the voltage is 189 - 264 V ac, 50/60 Hz, 15 amperes.

.....
: CAUTION :
.....

- * When the DT60 ANALYZER and the DTSC MODULE are installed together, 2 RECEPTACLES are necessary. Each RECEPTACLE should be within the specifications.
- ** Correct ground is very important to the stable operation of the FOS ASSEMBLY and the ELECTROMETER ASSEMBLY.
- *** The normal power specification is $\pm 10\%$ of the "nominal" local voltage. If the site voltage is less than 83 ± 2 V ac when the DT60 ANALYZER is energized, Error Code F17 occurs to indicate a brownout condition. When the site voltage is correct again, the DT60 ANALYZER initializes automatically.
- **** The normal power specification is $\pm 10\%$ of the "nominal" local voltage. If the site voltage is less than 178 ± 0 V ac when DT60 ANALYZER is energized, Error Code F17 occurs to indicate a brownout condition. When the site voltage is correct again, the DT60 ANALYZER initializes automatically.

Environmental Specifications



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XP3100-25

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Customer Equipment Services



Printed in USA



Modifications and Parts Kit Installation Instructions
for the
Kodak Ektachem DT60 ANALYZER
Kodak Ektachem DTE MODULE
and the
Kodak Ektachem DTSC MODULE

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CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

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Modification Instructions for the Kodak Ektachem DT60 ANALYZER:

<u>MODIFICATION NO.</u>	<u>PURPOSE:</u>
Modification No. M2	To make the ANALYZER more reliable by installing new PROMS on the CPU BOARD. To provide new features to the software by installing Version 9.0 software and new Operator Assistance Cards. To add testing for CREA, NH ₃ , HDLC and CO ₂ chemistries, and to allow for testing of additional chemistries at another time.
Modification No. M4	To make the ANALYZER more reliable and to support the AMMONIA and CREATININE chemistries by eliminating AMMONIA contamination.
Modification No. M5	To provide new features to the software by installing Version 10.7 software. This modification allows the capability of using the Kodak Ektachem DTSC MODULE with the ANALYZER.
Modification No. M6	To install a new LOWER RACK ASSEMBLY that will prevent condensation when running more than one TOTAL BILIRUBIN slide.

Modification Instructions for the Kodak Ektachem DTSC MODULE:

<u>MODIFICATION NO.</u>	<u>PURPOSE:</u>
Modification No. 1	To install a GROUND GLASS DIFFUSER FILTER on the CONDENSER LENS of the REFLECTOMETER. The new FILTER will eliminate all light wavelengths from the FLASH LAMP BELOW 300 NM., AND PREVENT DAMAGE TO THE CONDENSER LENS caused by ultraviolet light.

Installation Instructions for the Kodak Ektachem DTE MODULE and for the Kodak Ektachem DT60 ANALYZER:

<u>PART/KIT</u>	<u>PART NO.</u>
ELECTROMETER ASSEMBLY PARTS for the DTE MODULE	352751
PRESSURE PAD Type 2 PARTS ASSEMBLY for the DT60 ANALYZER	352706
UPGRADE KIT (V9.0/M12) for the DT60 ANALYZER	352891

Modification Instructions
for the
Kodak Ektachem DT60 ANALYZER

<u>Modification No.</u>	<u>Publication No.</u>	<u>Purpose</u>
M2	MA3100-3	<p>To make the ANALYZER more reliable by installing new PROMS on the CPU BOARD.</p> <p>To provide new features to the software by installing version 9.0 software and new Operator Assistance Cards.</p> <p>To add CREA, NH₃, HDLC, and CO₂ to the available tests, and to allow for additional tests at another time.</p>
M4	MA3100-5	<p>To make the ANALYZER more reliable and to support the NH₃ and CREA chemistries by eliminating NH₃ contamination.</p>
M5	MA3100-12	<p>To provide new features to the software by installing version 10.7 software. This modification allows the capability of using the Kodak Ektachem DTSC MODULE with the ANALYZER.</p>
M6	MA3100-4	<p>To install a new LOWER RACK ASSEMBLY that will prevent condensation when more than one TBIL slide is being processed.</p>



Publication No. MA3100-3
2/86

MODIFICATION INSTRUCTIONS
for the
Kodak Ektachem DT60 ANALYZER

Service Code: 3100

Modification No. M2

Type 1 Selective

Purpose

To make the ANALYZER more reliable by installing new PROMS on the CPU BOARD. To provide new features to the software by installing version 9.0 software and new Operator Assistance Cards. To add testing for CREA, NH₃, HDLC and CO₂ chemistries, and to allow for testing of additional chemistries at another time.

IMPORTANT

Use qualified personnel to install this modification.

Service Effects: The service publication, including the parts list, will be updated.

Special Requirements: Modification M2, M6 and M4 must be installed at the same time and in that sequence.

Serial Numbers: 100 - 2078.

Installation Time: Approximately 0.4 hours.

Special Tools: None.

Parts Status: Modification Kits will be available from PS during period 1, 1986.

Parts Requirements: See the parts list on page 2.

Canadian Job Code: 04.

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Install this modification during a special call.

Special Instructions: The TSR will determine if the ANALYZER will have version 9.0 software installed.

.....
: CAUTION :
.....



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Parts List:

Modification Kit 344293 includes:

Part No.	Description	Quantity
*	COM 350223	1
*	CLM 352395	1
*	Operator Assistance Cards	1
*	Operator's Manual	1
352365	Prom Kit includes:	1
*	Prom 1 616945	1
*	Prom 2 616946	1
*	Prom 3 616947	1
*	Prom 4 616948	1
*	Prom 5 616949	1

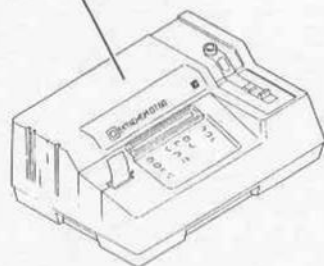
*Not stocked at Parts Services.

[1] Remove the MAIN COVER.

[2] Move the 2 SWITCHES on the DRIVER BOARD down or remove the JUMPER.

[3] To clear data from the NONVOLATILE RAM and to reset the CHECKSUM, enter option 73 and select "yes".

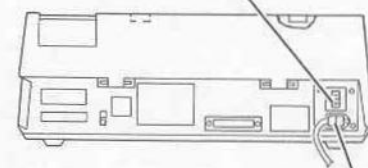
MAIN COVER



[4] Move the MAIN POWER SWITCH to the "0" position.

[5] Disconnect the MAIN POWER CABLE.

MAIN POWER SWITCH



MAIN POWER CABLE

[6] If necessary, disconnect the CABLE to the DTE MODULE.

[7] Is "2" circled on the MODIFICATION LABEL?



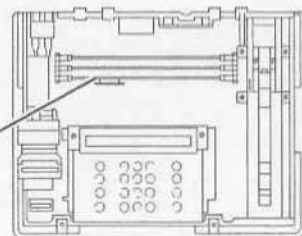
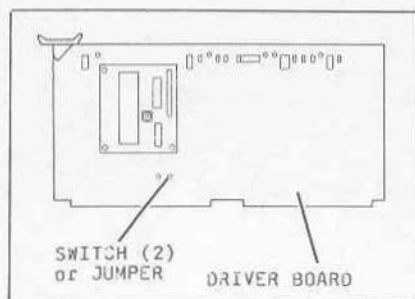
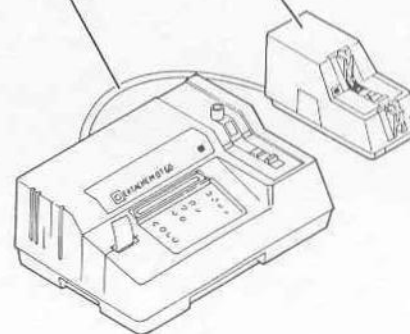
Install Modification M6.



Advance to step 8.

CABLE

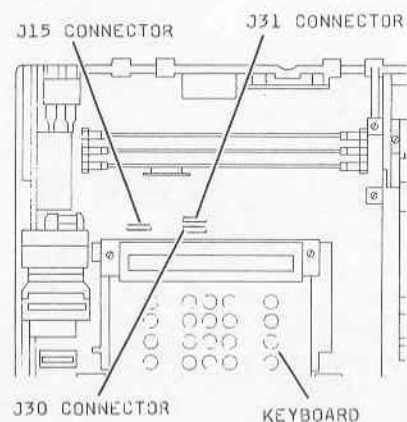
DTE MODULE



- [8] Disconnect the following CONNECTORS to remove the KEYBOARD:

- J15
- J30
- J31

- [9] Remove the KEYBOARD.

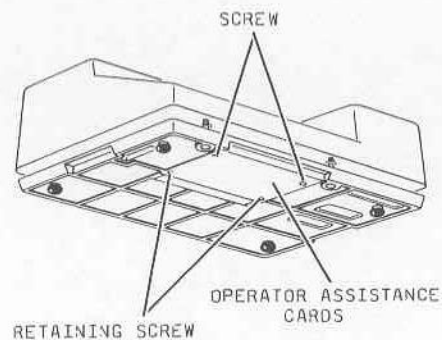


- [10] To install the new Operator Assistance Cards, remove the 2 SCREWS and loosen the 2 RETAINING SCREWS.

- [11] Remove and discard the existing Operator Assistance Cards.

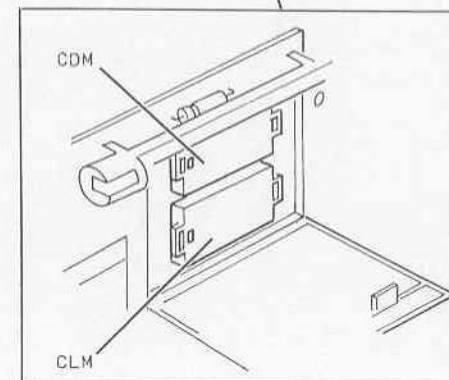
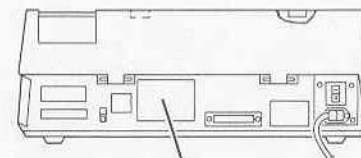
- [12] Insert the new Operator Assistance Cards.

- [13] Install the 2 SCREWS and tighten the 2 RETAINING SCREWS.



- [14] Remove and discard the existing CLM and CDM.

- [15] Install the new CLM 352395 and the new CDM 350223.



: CAUTION :

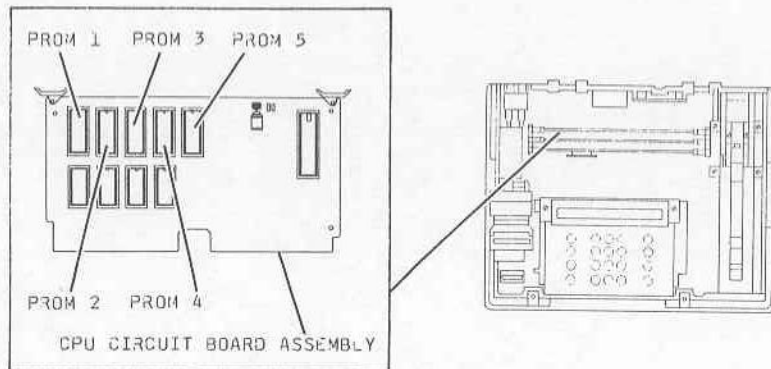
Possible damage from electrostatic discharge.

[16] Remove the CPU CIRCUIT BOARD ASSEMBLY.

[17] Remove and discard the existing PROMS 1, 2, 3, 4, and 5.

[18] Install the new PROMS:

- PROM 1 616945 at the "U1" position
- PROM 2 616946 at the "U2" position
- PROM 3 616947 at the "U3" position
- PROM 4 616948 at the "U4" position
- PROM 5 616949 at the "U5" position



[19] Install the CPU CIRCUIT BOARD ASSEMBLY.

[20] Remove and discard the revised pages of the Operator's Manual. Insert the new pages.

[21] Circle:



[22] When the service call is completed, provide the following information:

Service Code	3100
Modification No.	M2
Part Kit No.	344293

This form is for U.S. only.

Do not install the parts that you removed in this modification.

Printed in USA



Publication No. MA3100-5
2/86

MODIFICATION INSTRUCTIONS

for the

Kodak Ektachem DT60 ANALYZER
Kodak Ektachem DTE MODULE

Service Code: 3100

Modification No. M4

Type I Required

Purpose

To make the ANALYZER more reliable and to support the AMMONIA and CREATININE chemistries by eliminating AMMONIA contamination.

IMPORTANT

Use qualified personnel to install this modification.

Service Effects: Periodic checking of the FORS WEIGHT HEATER ASSEMBLY will allow for maintenance of the correct temperature. A newsletter article will be published. The new parts will be added to the parts list.

Special Requirements: Modifications M2, M6, and M4 or Modification M5, M6 and M4 must be installed at the same time and in that sequence.

Serial Numbers: 100 - 2078.

Installation Time: Approximately 5.5 hours.

Special Tools: TEMPERATURE PROBE TL-2598, SOLDERING IRON TL-2818, SOLDER TL-1294, WHITE REFERENCE SLIDE TL-3344, BLACK REFERENCE SLIDE TL-3345, ANTISTATIC DESOLDERER TL-3314, TIP HEIGHT ADJUSTMENT GAUGE TL-3446, PIPETTE ADJUSTMENT WRENCH TL-3455, DRILL TL-1466 and #30 DRILL BIT TL-8208.

Parts Status: Modification Kits will be available from PS during period 1, 1986.

Parts Requirements: See the parts list on page 2.

Canadian Job Code: 04.
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Install this modification during a special call.

Special Requirement: The customer must have calibration fluids and slides when Modification M4 is installed. The ESR should check that all calibrators and slides for necessary chemistries are at the customer's site.

.....
: CAUTION :
.....



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Parts List:

Modification Kit 352383 includes:

Part No.	Description	Quantity
031576	Nut	2
055850	Lock Washer	2
158943	Screw - 6.35 mm x 16.0 mm (8/32" x 5/8")	2
182590	Tie Wrap	1
220037	Resistor - Orange, Orange, Yellow	1
220035	Resistor - Yellow, Purple, Red	1
340999	Label, Hazard	1
344282	Pin	1
350204	Overshoot Spring	1
350281	Manual Pusher for the DTE MODULE	1
350295	Pressure Pad	1
352384	Heated Fors Weight Assembly	1

Parts List:

Modification Kit 352383 includes:

Part No.	Description	Quantity
352414	Heater Harness Assembly	1
352421	Light Lock	1
352422	Nut Plate	1
*	Template - 352426	1
528291	Washer	2
543628	Screw	2
586316	Tie Wrap	1
613833	Pivot Pin	1

*Not stocked at Parts Services.

- [1] Is Modification M4 installed?



Advance to step 17.



Advance to step 2.

- [2] Remove and discard the OVERSHOOT SPRING.

- [3] Install the new OVERSHOOT SPRING 350204.

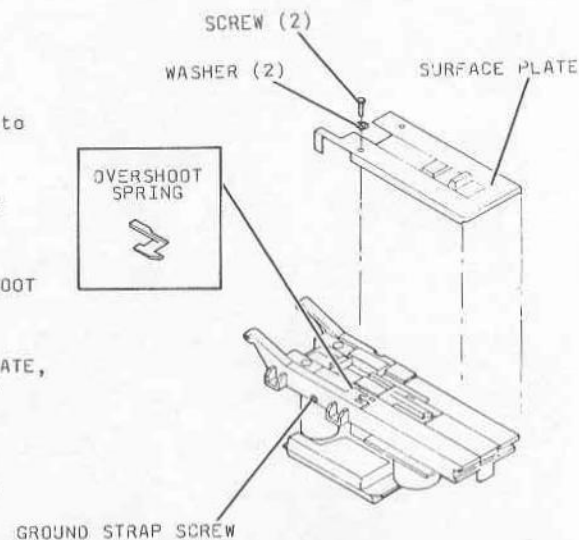
- [4] Install the SURFACE PLATE, 2 SCREWS and 2 WASHERS from Modification M6.

NOTE

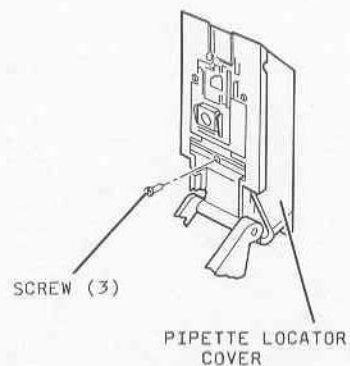
Do not tighten the 2 SCREWS.

- [5] Tighten or install the GROUND STRAP SCREW.

- [6] Tighten the 2 SCREWS.



- [7] Remove the 3 SCREWS and the PIPETTE LOCATOR COVER.



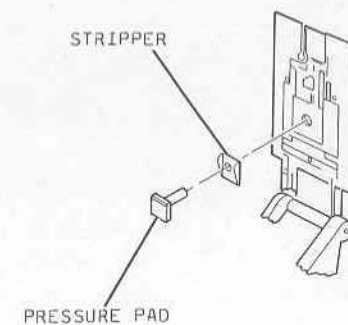
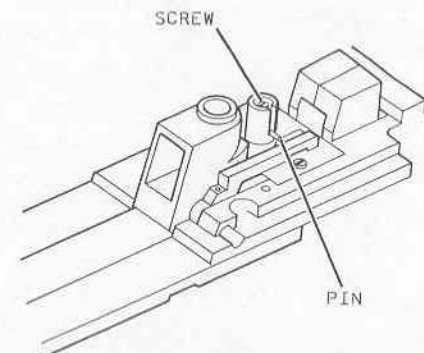
- [8] Do the following procedure to install the new PRESSURE PAD 350295:

- Remove the SCREW.
- Discard the PIN.
- Remove the PRESSURE PAD.
- Remove and keep the STRIPPER from the PRESSURE PAD.
- Discard the PRESSURE PAD.
- Place the STRIPPER on the new PRESSURE PAD.
- Place the rounded edge of the new PRESSURE PAD toward the front of the ANALYZER and install the PRESSURE PAD.
- Install the SCREW.

NOTE

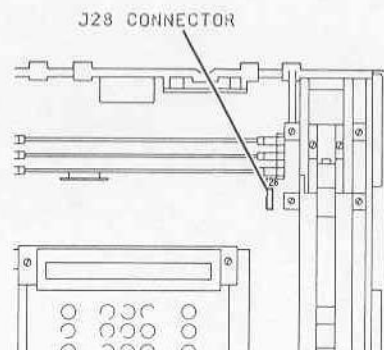
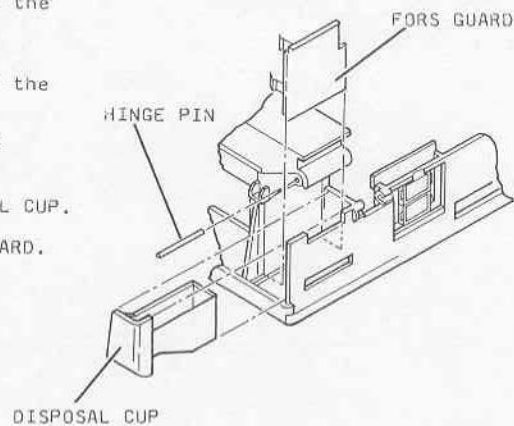
Do not tighten the SCREW.

- Install the new PIN 344282.
- Tighten the SCREW.

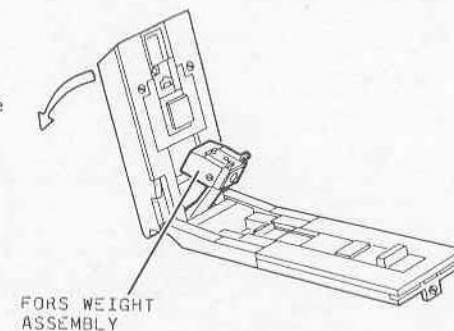


[2] Do the following procedure to install the HEATED FORS WEIGHT ASSEMBLY:

- Remove and discard the HINGE PIN.
- Disconnect the J28 CONNECTOR.
- Remove the DISPOSAL CUP.
- Remove the FORS GUARD.



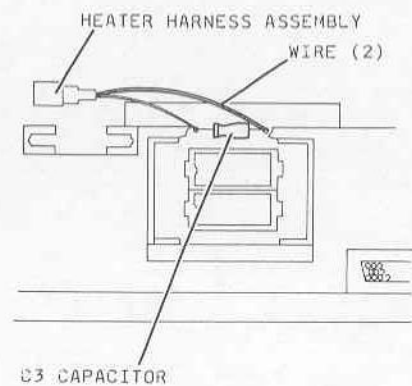
- Place the PIPETTE LOCATOR in the back position.
- Remove and discard the FORS WEIGHT ASSEMBLY.



- Use SOLDER TL-1294 and SOLDERING IRON TL-2818 to solder the 2 WIRES from the HEATER HARNESS ASSEMBLY to the C3 CAPACITOR on the CDM/CLM.

NOTE

If Modification 5 has been installed, the HEATER HARNESS ASSEMBLY is included in Modification 5.



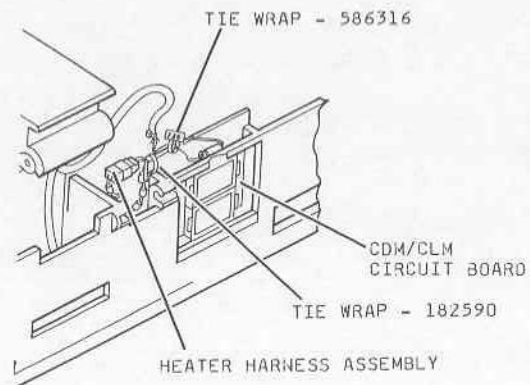
- Install the new FORS WEIGHT ASSEMBLY 352384 and the PIPETTE LOCATOR ASSEMBLY using the new PIVOT PIN 613833.

- Connect the FORS WEIGHT HEATER to the HEATER HARNESS ASSEMBLY.

.....
 • CAUTION •

The HEATER HARNESS ASSEMBLY must not touch the CPU CIRCUIT BOARD.

- Fasten the HEATER HARNESS ASSEMBLY to the CDM/CLM CIRCUIT BOARD using the new TIE WRAP 182590.
- Install the new TIE WRAP 586316 on the HEATER HARNESS ASSEMBLY and write "J35" on it.
- Connect the J28 CONNECTOR.



- [10] Do the following procedure to install the RESISTORS on the DRIVER BOARD:

.....
 • CAUTION •

Possible damage from electrostatic discharge.

- Remove the DRIVER BOARD.
- Use VACUUM DESOLDERING PUMP TL-1803 to remove and discard R37 and R39 RESISTORS.
- Install the new RESISTOR R39, 220037 and solder.

NOTE

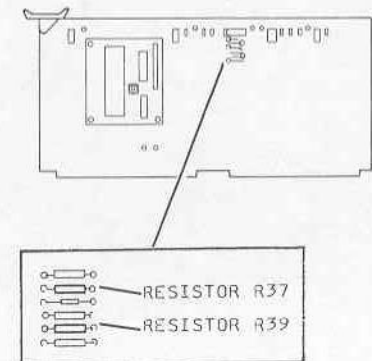
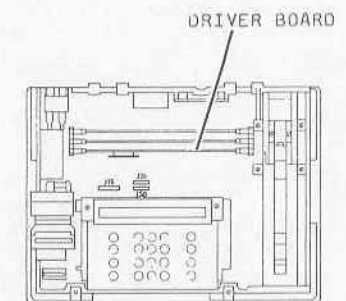
Orange, Orange, Yellow.

- Install the new RESISTOR R37, 220035 and solder.

NOTE

Yellow, Purple, Red

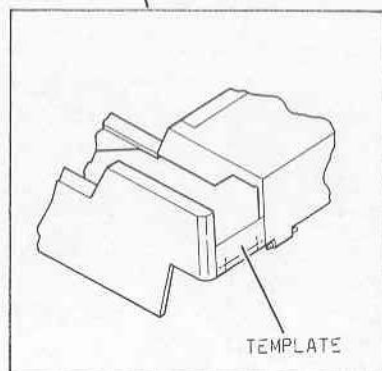
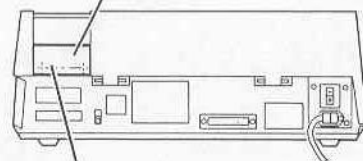
- Install the DRIVER BOARD.



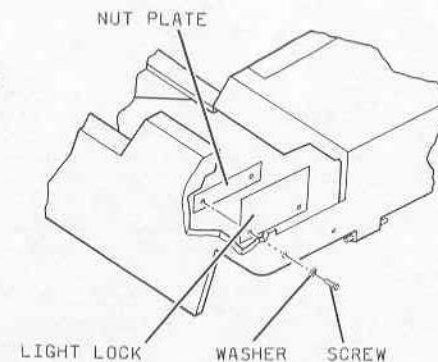
[11] Do the following to install the LIGHT LOCK:

- Use tape to hold the TEMPLATE 352426 on the MAIN COVER.
- Mark the position of the 2 holes.
- Remove and discard the TEMPLATE.

LIGHT LOCK
not visible

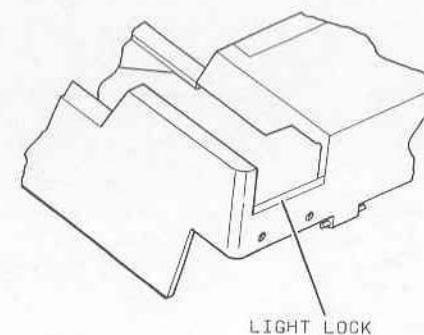


- Use DRILL TL-1466 and #30 DRILL BIT TL-8208, 3.25 mm (.128 in.) to make the 2 holes at the marks.

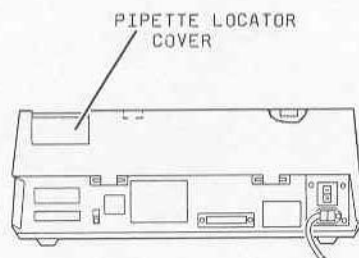
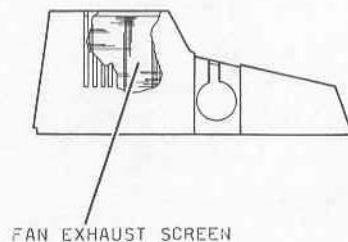


- Install the new LIGHT LOCK 352421, 2 WASHERS 528291, 2 SCREWS 543628, and the NUT PLATE 352422.

- Install the PIPETTE LOCATOR COVER and the 3 SCREWS.



- Remove and discard the FAN EXHAUST SCREEN.
- Install the MAIN COVER.
- Check that the LIGHT LOCK does not prevent the PIPETTE LOCATOR COVER from moving properly.
- If necessary, adjust the LIGHT LOCK.
- Remove the MAIN COVER.



[12] Remove and discard:

- 2 SCREWS
- FAN GUARD
- 2 LOCK WASHERS
- 2 NUTS

SCREW (2)
LOCK WASHER (2)
NUT (2)
not visible

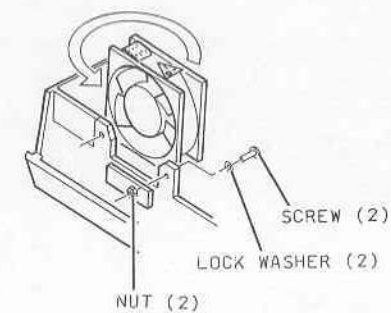
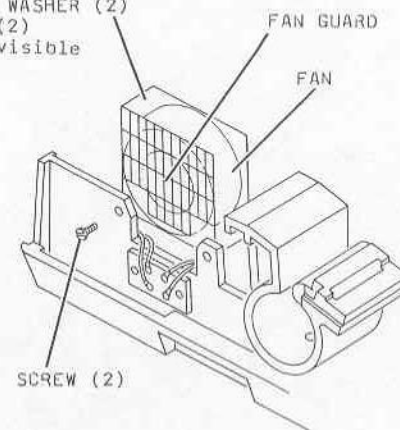
[13] Do the following procedure to move the FAN:

- Remove and discard the 2 SCREWS.
- Rotate the FAN 180°.

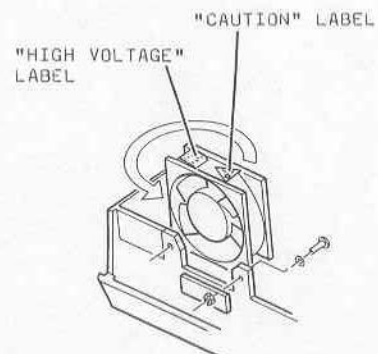
NOTE

Do not remove the J11 CONNECTOR.

- Place the 2 new LOCK WASHERS on the 2 new SCREWS.
- Install the 2 SCREWS and the 2 LOCK WASHERS.
- Install the 2 new NUTS.



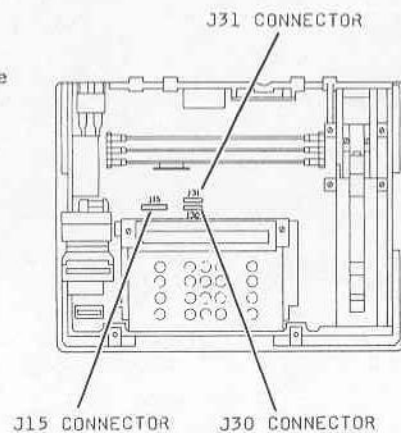
- Move the "High Voltage" LABEL to make a space for the "Caution" LABEL.
- Place the new "Caution" LABEL 340999 adjacent to the "High Voltage" LABEL.



- [14] Connect the following CONNECTORS and install the KEYBOARD:

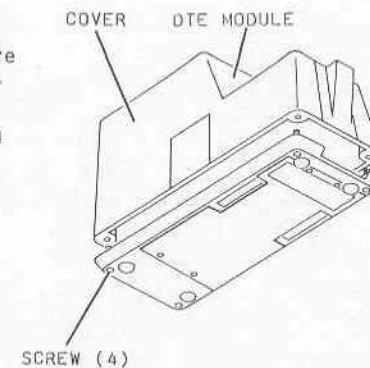
- J15
- J30
- J31

- [15] Install the MAIN POWER CORD.

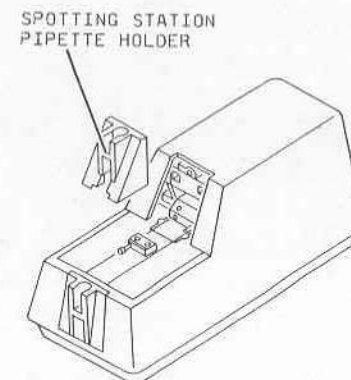


- [16] If there is a DTE MODULE, do the following procedure to install the new MANUAL PUSHER:

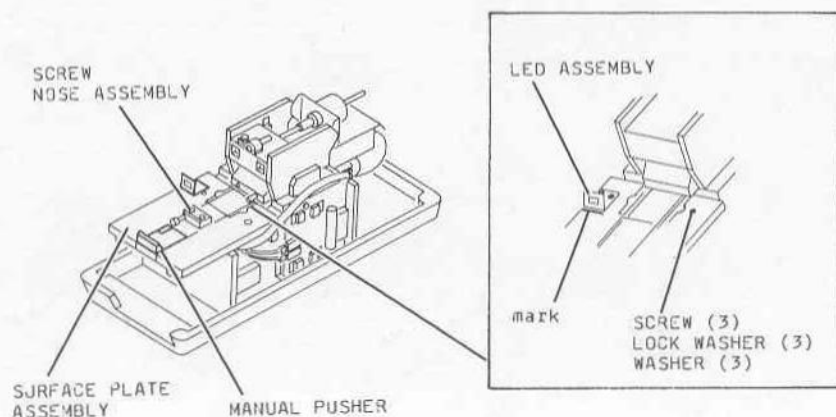
- Loosen the 4 SCREWS and remove the COVER.



- Remove the SPOTTING STATION PIPETTE HOLDER.



- Draw a mark at the position of the LED ASSEMBLY on the SURFACE PLATE ASSEMBLY.
- Loosen the SCREW and remove the NOSE ASSEMBLY.
- Remove the 3 SCREWS, 3 LOCK WASHERS, and 3 WASHERS from the SURFACE PLATE ASSEMBLY.
- Remove the SURFACE PLATE ASSEMBLY.
- Remove and discard the MANUAL PUSHER.



- Install the new MANUAL PUSHER 350281.
- Place the SURFACE PLATE ASSEMBLY in the correct position.
- Place the LED ASSEMBLY in the position of the mark on the SURFACE PLATE ASSEMBLY.
- Install the 3 SCREWS, 3 LOCK WASHERS, and 3 WASHERS to hold the SURFACE PLATE.
- Install the NOSE ASSEMBLY and tighten the SCREW.
- Install the SPOTTING STATION PIPETTE HOLDER.
- Install the COVER and tighten the 4 SCREWS.
- Install the CABLE to the OTE MODULE.

[17] Check that the following adjustment is correct:

NOTE

Use the TIP HEIGHT ADJUSTMENT GAUGE TL-3446.

Adjustment
TIP-Height

[18] Move the MAIN POWER SWITCH to "1".

[19] Check that the following adjustments are correct:

Adjustment
SPOT DETECTOR
UPPER & LOWER RACK
UPPER ARM
INCUBATOR - Temperature

[20] Install the MAIN COVER.

[21] Check that the following adjustment is correct:

Adjustment
FORS ASSEMBLY

[22] Remove the MAIN COVER.

[23] Install the FORS GUARD and the DISPOSAL CUP.

[24] Install the MAIN COVER.

[25] Enter option "0", to reset the UPPER RACK and LOWER RACK.

[26] Do the following procedure in the Special Procedures section of the service publication:

Procedure
Correction Factors for the WHITE REFERENCE and BLACK REFERENCE

[27] Do the following Special Procedure:

Procedure
Test for D_R

[28] Ask the customer if they want the results of the test for "Blood Urea Nitrogen" as "UREA" or "BUN". Also, ask the customer if they want results in "mg/dl" or "mmols/L". Enter the correct options.

Options	Reporting Method
63 and 92	UREA, mg/dl
64 and 92	-
63 and 93	BUN, mg/dl
64 and 93	UREA, mmols/L

[29] Do the following procedures in the Operator's Manual for all of the customer's chemistries:

Procedure	Section
How to Calibrate	3
Quality Control	4

[30] Check the calibration and quality control results with the customer.

[31] Circle:



[32] When the service call is completed, provide the following information:

Service Code	3080
Modification No.	M4
Part Kit No.	352383

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Publication No. MA3100-12
6/86

MODIFICATION INSTRUCTIONS

for the
Kodak Ektachem DT60 ANALYZER

Service Code: 3100

Modification No. M5

Type 1 Selective

Purpose

To provide new features to the software by installing version 10.7 software. This modification allows the capability of using the Kodak Ektachem DTSC MODULE with the ANALYZER.

IMPORTANT

Use qualified personnel to install this modification.

Service Effects:	The new parts will be added to the parts list.
Special Requirements:	If modifications 6 and 4 are not installed, install modification 6 and 4 in that sequence after modification 5.
Serial Numbers:	60000100 - 60002999, 60003017 - 60003999.
Installation Time:	Approximately 1 hour.
Special Tools:	None.
Special Materials:	2 small WIRE TIES 428631 100-grit SANDPAPER, available locally
Parts Status:	Modification Kits will be available from PS during period 6, 1986.
Parts Requirements:	See the part list on page 2.
Canadian Job Code:	04.

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Install this modification during a special call.

Special Instructions: The TSR will determine if the ANALYZER will have version 10.7 software installed.

.....
: CAUTION :
.....



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Parts List:

Modification Kit 351640 includes:

Part No.	Description	Quantity
351449	Address Harness Assembly	
351637*	Data Plate	1
351638*	Operator's Manual - revised pages only	1
351639	Operator Assistance Cards	1
351662*	Label - "Mod 5 Return"	1
352399	CDM/CLM Board with Heater Harness	1
352400*	Pipette	1
352520	I/O Circuit Board	1
352591*	CLM, Version 10.7	1
352592*	CDM, Version 10.7	1
352599*	Label - "Exchange Part"	1
352616	CPU Circuit Board - Version 10.7	1
613872*	Label - "Caution High Leakage"	1

*Not stocked at Parts Services.

[1] Open the modification kit and check that all the parts are included. See the parts list on page 3.

[2] Enter option 13 and record the software version in use. You will use this information again in steps 13, 32, and 57. Is the version 8.3 or 8.4?



Advance to
step 5.

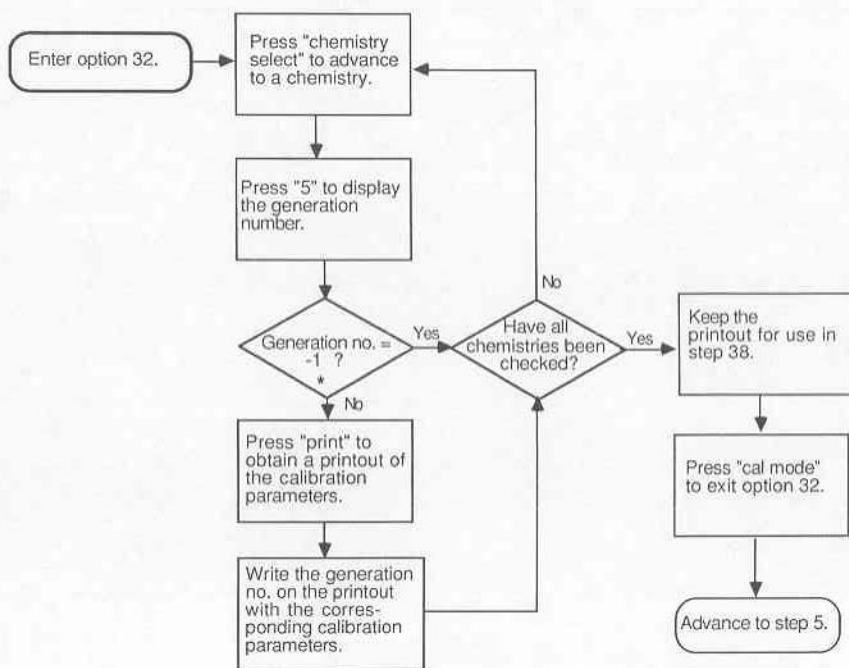


Advance to
step 3.

In steps 3 and 4, you will obtain data from the existing NONVOLATILE RAM that will be entered into the new NONVOLATILE RAM in steps 37 and 38.

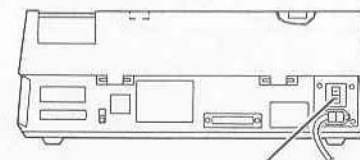
[3] Enter option 36 to obtain a printout of the correction factors.

[4] Do the following procedure to obtain calibration parameters for calibrated chemistries:



* A generation number of -1 indicates that no calibration parameters exist for the chemistry selected.

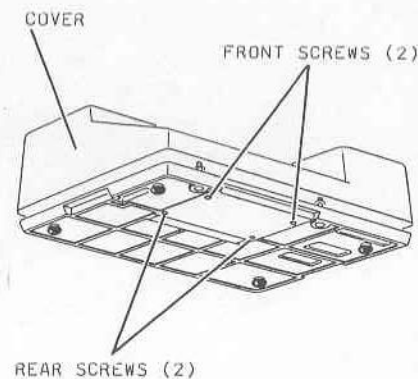
[5] Move the MAIN POWER SWITCH down to the "0" position.



MAIN POWER SWITCH

[6] Do the following procedure to install the new OPERATOR ASSISTANCE CARDS:

- Loosen the 2 REAR SCREWS.
- Remove the 2 FRONT SCREWS.
- Remove and discard the old OPERATOR ASSISTANCE CARDS.
- Install the 2 FRONT SCREWS.
- Tighten the 2 REAR SCREWS.
- Give the new OPERATOR ASSISTANCE CARDS 351693 to the customer. The new CARDS will not be inserted in the ANALYZER.



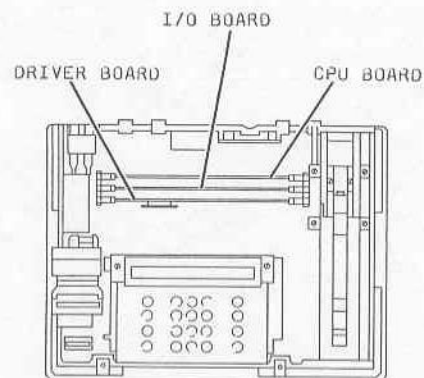
[7] Remove the COVER.

CAUTION

Possible damage from
electrostatic discharge.

[8] Remove:

- DRIVER BOARD
- I/O BOARD
- CPU BOARD



[9] Disconnect CONNECTORS J31,
J30, J15.

[10] Remove the KEYBOARD.

[11] Option 13 in step 2
indicated the existing
software version. Was
this version 8.3 or 8.4?



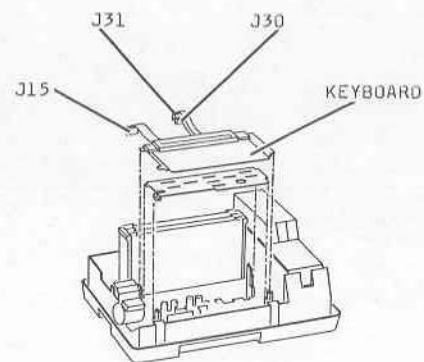
Yes

Advance to
step 24.



No

Advance to
step 12.



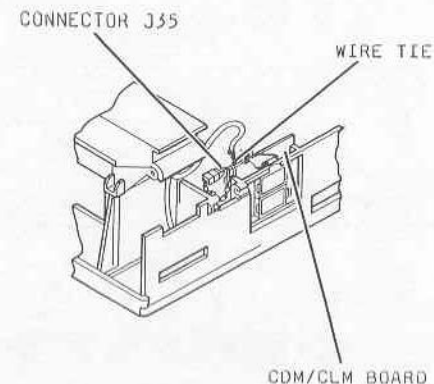
In steps 12 to 17, you
will change the path of
the wires from the FORS
WEIGHT HEATER. This will
prevent binds in the FORS
WEIGHT caused by
obstructions from the
wires.

In some ANALYZERS the wire
path will already be
correct, so all of these
steps might not be
necessary.

[12] Cut the WIRE TIE.

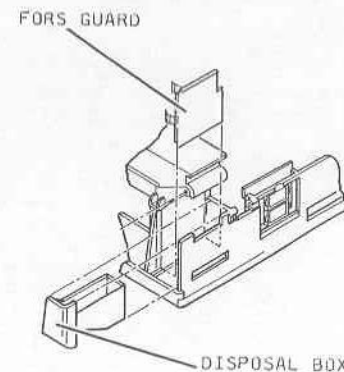
[13] Disconnect CONNECTOR J35.

[14] Remove and discard the
CDM/CLM BOARD.



[15] Remove:

- DISPOSAL BOX
- FORS GUARD

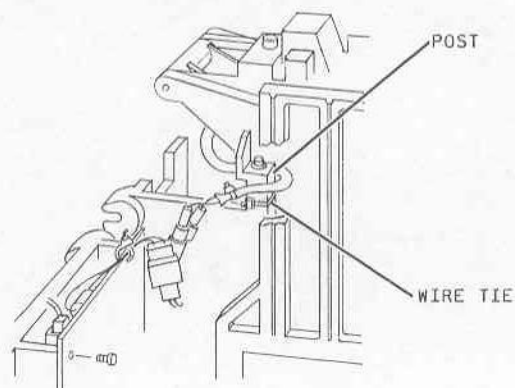


- [16] Attach a WIRE TIE tightly to the POST. See the figure for the correct position.

NOTE

Do not attach the wires to the POST with the WIRE TIE. The WIRE TIE will support the wires.

- [17] Move the wires around the POST and above the WIRE TIE. See the figure.



- [18] Install in the new CDM/CLM BOARD 352399:

- CLM 352591
- CDM 352592

- [19] Install the new CDM/CLM BOARD 352399.

- [20] Connect CONNECTOR J35 to the CDM/CLM BOARD.

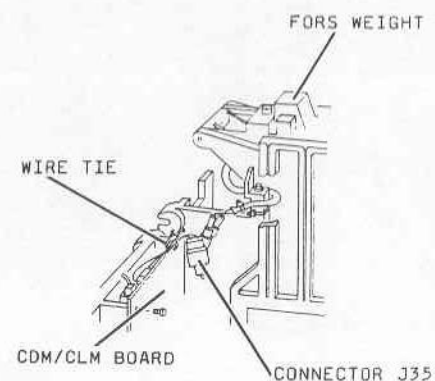
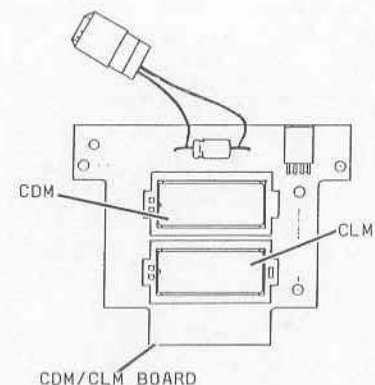
- [21] Use a WIRE TIE to attach CONNECTOR J35 to the CDM/CLM BOARD.

- [22] Check that the FORS WEIGHT can be lifted completely. If necessary, move the wire to enable free motion of the FORS WEIGHT.

- [23] Install:

- FORS GUARD
- DISPOSAL CUP

Advance to step 27.

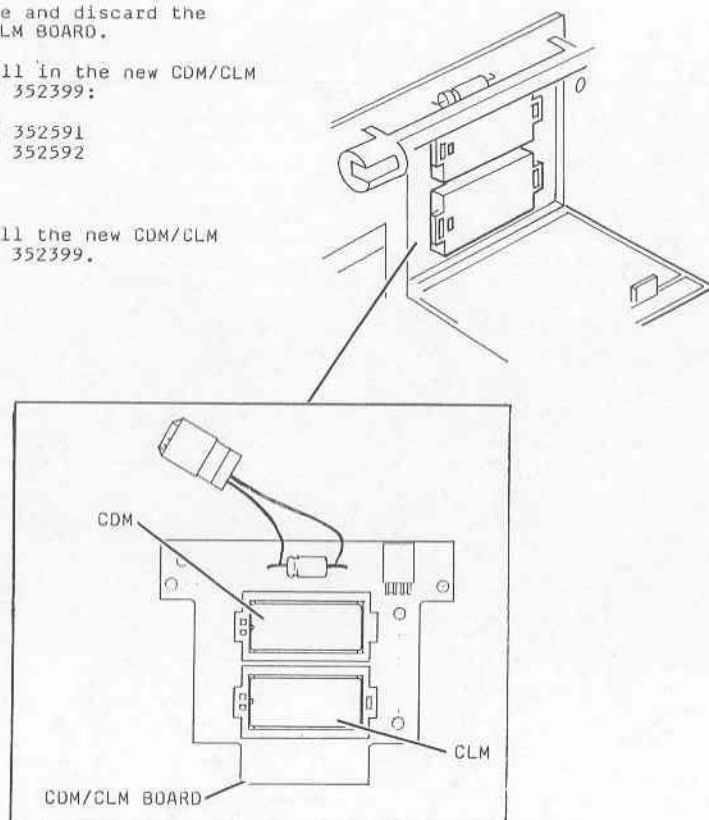


[24] Remove and discard the CDM/CLM BOARD.

[25] Install in the new CDM/CLM BOARD 352399:

- CLM 352591
- CDM 352592

[26] Install the new CDM/CLM BOARD 352399.



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[27] Install:

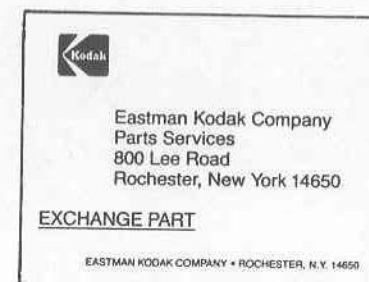
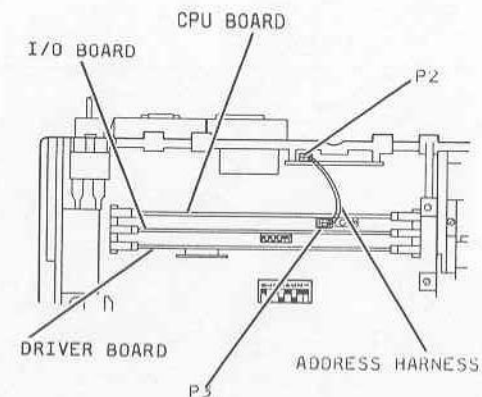
- DRIVER BOARD
- new I/O BOARD 352520
- new CPU BOARD 352602

[28] Connect the ADDRESS HARNESS 351449 to CONNECTOR P2 on the CDM/CLM BOARD.

[29] Connect the other end of the ADDRESS HARNESS 351449 to CONNECTOR P3 on the CPU BOARD.

[30] Pack the old I/O BOARD and CPU BOARD in antistatic material.

[31] Attach the "EXCHANGE PART" LABEL 352599 to the package for the I/O and CPU BOARDS and return to PS.



"EXCHANGE PART" LABEL

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[32] Option 13 in step 2 indicated the existing software version.
Was this version 8.3 or 8.4?



Advance to
step 44.



Advance to
step 33.

[33] Connect CONNECTORS J31, J30, and J15.

[34] Install the KEYBOARD.

[35] Move the MAIN POWER SWITCH up to the "1" position.

[36] Do the following procedure to clear data from the NONVOLATILE
RAM:

- Enter option 73.
- Enter "1" to initialize the memory and reset the checksum.
- Move the MAIN POWER SWITCH down to the "0" position.
- Wait 5 seconds.
- Move the MAIN POWER SWITCH up to the "1" position.
- Check that "D19-MEMORY TEST" appears on the printout. This message indicates that the NONVOLATILE RAM is cleared.

[37] Do the following procedure to enter correction factors from the
printout obtained in step 3:

- Enter option 81. The existing correction factor for the first LED will be displayed.
- Press "clear" to delete the existing value.
- Enter the new correction factor from the printout obtained in step 3.

IMPORTANT

Check that you correctly entered negative signs and decimal places.

- Continue this procedure until you have correctly entered all 6 correction factors.

NOTE

The printout from option 36 that you obtained in step 3 also includes slide reflectances, but this data will not be used.

[38] Do the following procedure to enter the calibration parameters and generation numbers for the each of the chemistries selected in step 4:

- Enter option 32.
- Press "chemistry select" to advance to the first chemistry you will revise.
- Press "1" to display the existing calibration parameter for the first level.
- Press "clear" to clear the first calibration parameter.
- Enter the calibration parameter from the printout obtained in step 4.
- Press "2", "3", and "4", if necessary, to advance to additional levels. Press "clear" and enter the new calibration parameters from the printout.

NOTE

CREA is the only chemistry with a level 4 calibration parameter.

- Press "5" to display the existing generation number for the chemistry.
- Press "clear" to delete the generation number.
- Enter the generation number from the printout obtained in step 4.

- Press "print" to obtain a printout of the calibration parameters you entered.

NOTE

The software might round the last decimal place of the calibration parameters you entered. This could cause the calibration parameters on the printout to be slightly different from the values you entered.

- Check the printout to determine that you entered the calibration parameters correctly. Note decimal places and negative signs.
- Write the date on the printout and keep it with the Operator's Manual at the customer site. This data could be used to reduce the time necessary for future service calls relating to CPU or memory malfunctions.
- Press "chemistry select" to advance to the other chemistries you will revise.
- Continue this procedure until all the calibration parameters from the printout have been entered.
- Press "calibration mode" to enter the new values to the NONVOLATILE RAM and to calculate new checksums.

NOTE

A delay will occur after pressing "calibration mode". This is normal, and caused by the calculation of the new checksum.

[39] Install the COVER.

[40] Do the Dr Procedure.

NOTE

A revised Dr procedure was included with the instructions for Modifications 2, 4, and 6. It is important that the DISPOSAL CUP and FORS GUARD be installed when you do the Dr procedure.

[41] Ask the customer if they want the results of the test for "Blood Urea Nitrogen" as "UREA" or "BUN". Also, ask the customer if they want results in "mg/dl" or "mmols/L". Enter the correct options.

Options	Reporting Method
63 and 92	UREA, mg/dl
64 and 92	-
63 and 93	BUN, mg/dl
64 and 93	UREA, mmols/L

[42] Execute option 36 to obtain a printout of the slide reflectances.

[43] Write the date on the printout and keep it with the Operator's Manual at the customer site. This data could be used to reduce the time necessary for future service calls relating to CPU or memory malfunctions.

[44] Is the DATA PLATE on the bottom of the ANALYZER?



Advance to step 50.



Advance to step 45.

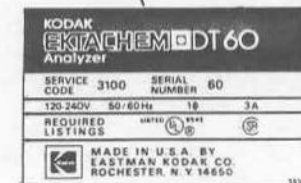
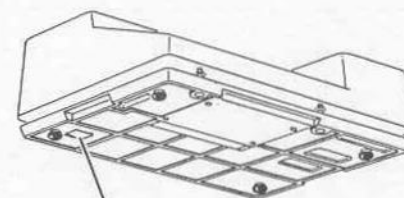
[45] Remove the existing DATA PLATE.

[46] Use a BALLPOINT PEN to write the serial number of the ANALYZER on the new DATA PLATE 351637. Write with pressure.

[47] To allow the new DATA PLATE to adhere, use 100-grit SANDPAPER to remove the paint in the area where the new DATA PLATE will be installed.

[48] Clean the paint dust from the area with water, and allow the area to dry completely.

[49] Attach the new DATA PLATE 351637. The top of the DATA PLATE should be toward the front of the ANALYZER, so that you can read the DATA PLATE when you lift the front end of the ANALYZER.



DATA PLATE

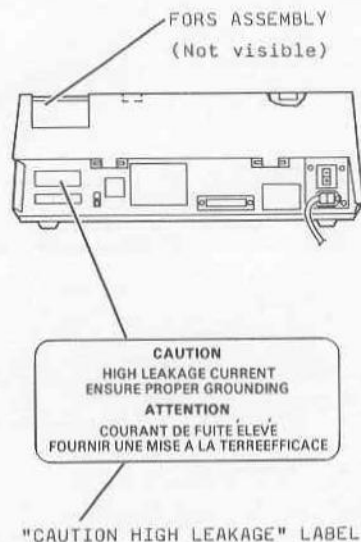
[50] Do the following procedure to attach the "CAUTION HIGH LEAKAGE" LABEL 613872:

- If necessary, use 100-grit SANDPAPER to make the paint surface smooth to allow the LABEL to adhere.

.....
: CAUTION :
.....

Do not allow paint dust to contaminate the area of the FORS ASSEMBLY.

- Attach the LABEL.



In steps 51 to 53, you will exchange the customer's PIPETTE with the new PIPETTE 352400 included in the modification kit.

IMPORTANT

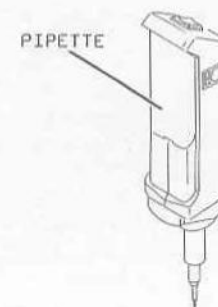
The old PIPETTE will cause errors if used with the new rate chemistries.

If the customer purchased more than one PIPETTE, you should give the customer credit, using the "Kodak Usage Request Form". See the figure for step 59.

If the customer has additional PIPETTES that were not purchased, they should be removed from the customer site and discarded.

[51] Remove the new PIPETTE 352400 from the CARTON.

[52] Place the old PIPETTE in the CARTON.



Modification Instructions
for the
Kodak Ektachem DTSC MODULE

<u>Modification No.</u>	<u>Publication No.</u>	<u>Purpose</u>
M1	MA3111-1	To install a GROUND GLASS DIFFUSER FILTER on the CONDENSER LENS of the REFLECTOMETER. The new FILTER will eliminate all light wavelengths from the FLASH LAMP below 300 nm, and prevent damage to the CONDENSER LENS caused by ultraviolet light.



Publication No. MA3111-1
10/86

MODIFICATION INSTRUCTIONS

for the

Kodak Ektachem DTSC MODULE

Service Code: 3111

Modification No. 1

Type 1 Selective

Purpose

To install a GROUND GLASS DIFFUSER FILTER on the CONDENSER LENS of the REFLECTOMETER. The new FILTER will eliminate all light wavelengths from the FLASH LAMP below 300 nm, and prevent damage to the CONDENSER LENS caused by ultraviolet light.

IMPORTANT

Use qualified personnel to install this modification.

Service Effects: The new parts will be added to the parts list.

Special Requirements: None.

Serial Numbers: See the list on page 3.

Installation Time: 5 minutes, and 1 hour to process CONTROLS.

Special Tools: TWEEZERS TL-1207
LAMP REMOVAL TOOL TL-3580

Parts Status: The modification kit will be available from PS during period 10, 1986.

Parts Requirements: See the parts list on page 2.

Canadian Job Code: 04

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Install this modification during the next call.

Special Instructions: You will process Kodak Ektachem DT CONTROLS for all rate chemistries that the customer uses.

Special Materials: Eye protection
Disposable cloth gloves

Parts List:

Modification Kit No. 351780 includes:

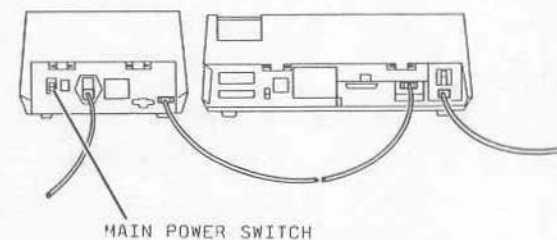
Part No.	Description	Quantity
351776	Adhesive, Foam	1
642168	Filter, Ground glass diffuser	1
869623	Label, Modification	1

Serial Numbers

MODULES with the following serial numbers require this modification:

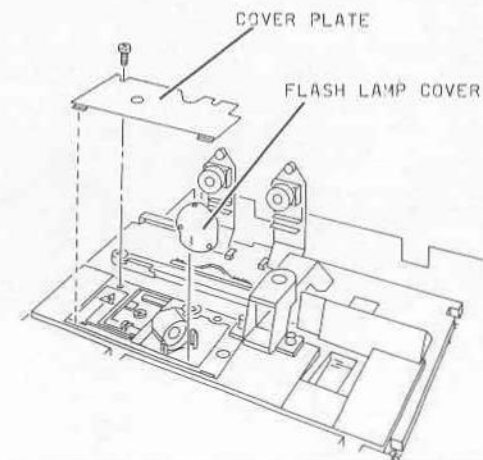
62000046	62000320	62000564
62000048 - 62000063	62000322	62000566
62000065 - 62000080	62000323	62000569 - 62000573
62000082 - 62000084	62000325 - 62000330	62000575 - 62000577
62000086 - 62000095	62000332 - 62000334	62000579
62000097 - 62000173	62000336 - 62000341	62000582
62000175 - 62000195	62000343 - 62000345	62000583
62000198 - 62000201	62000347 - 62000351	62000586 - 62000588
62000203 - 62000215	62000363 - 62000387	62000590 - 62000593
62000217 - 62000232	62000389 - 62000393	62000596 - 62000599
62000234 - 62000251	62000395 - 62000425	62000601 - 62000605
62000253 - 62000259	62000427 - 62000432	62000608 - 62000614
62000261 - 62000269	62000435 - 62000447	62000616
62000271	62000449 - 62000470	62000619 - 62000623
62000272	62000472 - 62000479	62000625 - 62000630
62000274 - 62000281	62000481 - 62000484	62000634
62000283	62000486 - 62000488	62000635
62000284	62000490 - 62000500	62000637
62000286	62000502 - 62000512	62000639
62000288	62000514	62000640
62000289	62000515	62000642 - 62000644
62000291	62000518 - 62000527	62000646
62000292	62000529	62000647
62000294	62000531 - 62000543	62000649 - 62000654
62000296 - 62000306	62000545 - 62000547	62000656
62000308 - 62000311	62000549 - 62000559	62000659 - 62000664
62000313 - 62000318	62000561	

[1] Move the MAIN POWER SWITCH down to the "0" position.



[2] Remove:

- COVER PLATE
- FLASH LAMP COVER

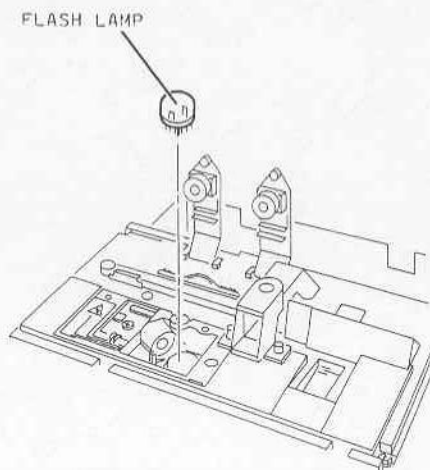


WARNING

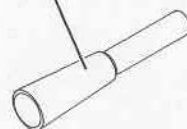
Use eye protection when handling the FLASH LAMP. This part could explode if broken.

Do not touch the FLASH LAMP with your hand. Use clean cloth gloves.

- [3] Remove the FLASH LAMP. Use the LAMP REMOVAL TOOL TL-3580.



LAMP REMOVAL TOOL TL-3580



CAUTION

Do not touch the GROUND GLASS DIFFUSER FILTER 642168 with your hand. Use clean cloth gloves. Clean the FILTER with compressed air if necessary.

- [4] The FILTER has a rough surface and a smooth surface. Find the rough surface.

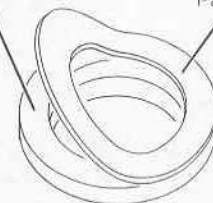
- [5] Place the FILTER on tissue to keep it clean. Place the rough side up.

- [6] Remove the paper from one side of the FOAM ADHESIVE 351776.

- [7] Attach the FOAM ADHESIVE to the rough surface of the FILTER. See the figure for the correct position.

FOAM ADHESIVE

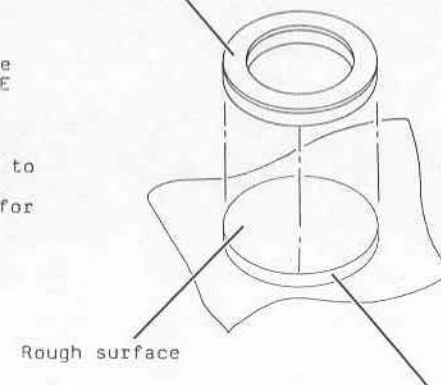
Paper



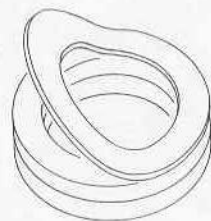
FOAM ADHESIVE

Rough surface

GROUND GLASS DIFFUSER FILTER



- [8] Remove the paper from the other side of the FOAM ADHESIVE.

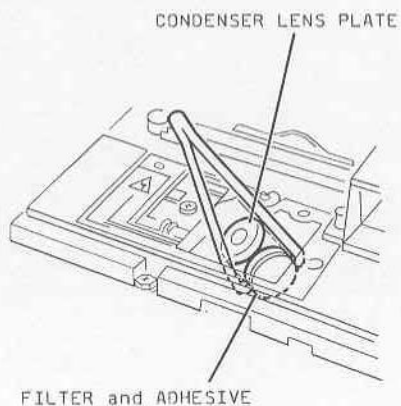


- [9] Use TWEEZERS TL-1207 to place the FILTER and FOAM ADHESIVE over the CONDENSER LENS PLATE.

- [10] Press the FILTER with the TWEEZERS TL-1207 to attach it tightly to the CONDENSER LENS PLATE.

NOTE

The FILTER must be completely parallel to the PLATE. Press the entire circumference of the FILTER.



- [11] If necessary, clean the FLASH LAMP and FILTER with alcohol and a swab.

- [12] Install:

- FLASH LAMP
- FLASH LAMP COVER
- COVER PLATE

- [13] Move the MAIN POWER SWITCH up to the "1" position to energize the MODULE.

- [14] Wait 5 minutes for the MODULE to initialize.

- [15] Process CONTROLS for all the chemistries that the customer uses.

- [16] Are all CONTROLS within specification?



Advance to step 21.



Advance to step 17.

=====

Do steps 17 to 19 to obtain the gains and A/D units. Then call TAC for assistance, and provide the information obtained.

=====

[17] Execute option 50 to obtain a printout of the gains.

[18] Execute option 106 using the following procedure:

- Enter "340" for filter wavelength
- Enter "1" for type
- Enter "10" for reads
- Insert a slide and then remove it. The readings will be made on the WHITE REFERENCE.

[19] Check the printout for option 106:

- the "OFST"
- the "STD. DEV." for DR

[20] Call TAC for assistance.

```

*****
DTSC GAINS
*****
      REF      SMP
340-  43.78    66.06
400-  68.77    40.55
460-  38.28    23.273
680-  33.301   20.793
  
```

```

*****
FILTER  340
TYPE    1
OFST = 338
REF = 29566
  
```

```

      DR      A/D
.048041  29576
.048133  29571
.048016  29578
.048114  29573
.048100  29572
.048041  29576
.048133  29571
.048016  29578
.048114  29573
.048100  29572
  
```

```

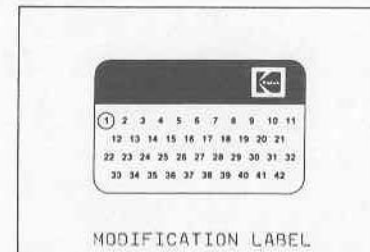
----- MEAN -----
.048063  29575
  
```

```

----- STD. DEV. -----
.000049265  7.3684
*****
  
```

[21] Attach the MODIFICATION LABEL 869623 to the back of the MODULE. See the figure.

[22] Circle:



[23] When the service call is completed, provide the following information:

Service Code	3111
Modification No.	401
Part Kit No.	351730

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Customer Equipment Services

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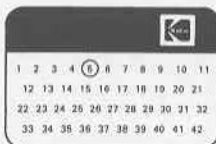
MA3111-1
10/86



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- Mark Simon
Eastman Kodak Company
CPD-EM, Dept. 162
100 Carlson Road
Rochester, NY 14610

[54] Replace the pages in the customer's Operator's Manual with the new pages included in the modification kit.



Service Code	3100
Modification No.	M5
Part Kit No.	351640



Advance to
step 60.

When doing step 9 of Modification 4, also do step 14 to 19 of Modification 5, to move the wires from the FORS WEIGHT HEATER to the correct path.


NOTE

The installation is completed. Do not advance to step 60.

- [60] Process CONTROLS for all chemistries. Use the new PIPETTE.

DEALER NAME		DATE	
ADDRESS		ST. NO SERIAL NO.	
CITY	STATE	ZIP CODE	PHONE NO.
TWR / SSR		SERVICE <input type="checkbox"/> OTHER <input type="checkbox"/> DPG <input type="checkbox"/> CESSO	
CUSTOMER NAME			
ADDRESS		PHONE	
CITY	STATE	ZIP CODE	

ITEM		QTY.	ITEM		QTY.
SLIDES	Dic拉克 (D13)				
	BLUAFINE				
	[Kic Acid (K10C)]				
	Hemoglobin (H10)				
	Total Protein (T10)				
	Triglycerides (TRIG)				
	Amylase (AMYL)				
	Cholesterol (CHOL)				
	Creatinine (CREA)				
	Aspartate (ASP)				
Total Bilirubin (TBL)					
CALIBRATORS / FLUIDS					
	Cholesterol (C1 -)				
	Potassium (K -)				
	Sodium (Na -)				
	Carbon Dioxide (CO2)				
	Reference Fluid				
	Control Fluid No. 1				
	Control Fluid No. 2				



KODAK USA REQUEST
CLINICAL CHEMISTRY

FOR CREDIT USE ONLY / NO PRODUCT REPLACEMENT

800-851-732 (T-851) • EASTMAN KODAK COMPANY

d 2552

[17] Circle:

										
1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	
22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	

[20] Do Modification M4.

[18] When the service call is completed, provide the following information, if the LOWER RACK was installed:

Service Code	3100
Modification No.	M6
Part Kit No.	352439

[19] IF the LOWER RACK was not installed, do not provide the part number to SCAN. Use the modification kit for another customer.

Service Code	3100
Modification No.	M6
Part Kit No.	-

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MA3100-12
5/86



Printed in USA



Publication No. MA3100-4
2/86

MODIFICATION INSTRUCTIONS

for the
Kodak Ektachem DT60 ANALYZER

Service Code: 3100

Modification No. M6

Type 1 Required

Purpose

To install a new LOWER RACK ASSEMBLY that will prevent condensation when running more than one TOTAL BILIRUBIN slide.

IMPORTANT

Use qualified personnel to install this modification.

Service Effects: The new parts will be added to the parts list.

Special Requirements: Modifications M2, M6 and M4 or Modifications M5, M6 and M4 must be installed at the same time and in that sequence.

Serial Numbers: 100 - 2078.

Installation Time: Approximately 0.4 hours.

Special Tools: None.

Parts Status: Modification Kits will be available from PS during period 1, 1986.

Parts Requirements: See the parts list on page 2.

Canadian Job Code: 04.

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Install this modification during a special call.

Parts List:

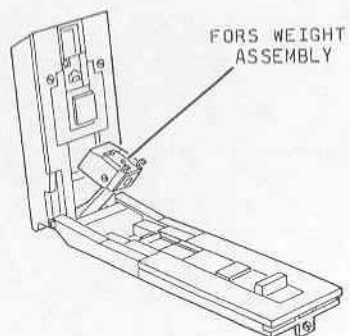
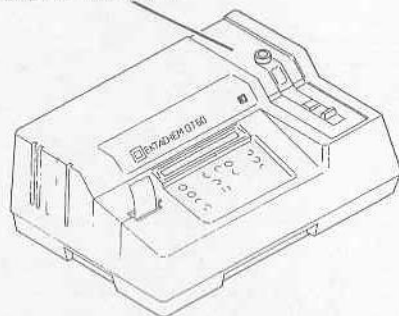
Modification Kit 352439 includes:

Part No.	Description	Quantity
352434	Lower Rack Assembly	1

[1] Open the PIPETTE LOCATOR.

PIPETTE LOCATOR

[2] Lift the FORS WEIGHT ASSEMBLY.



[3] Observe the LOWER RACK ASSEMBLY and check if the top of the LOWER RACK is the correct configuration.



Do steps
7 - 9, and
17 - 19.

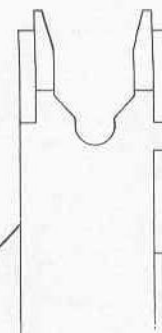


Advance to
step 4.

LOWER RACK
ASSEMBLY



Correct



Not correct

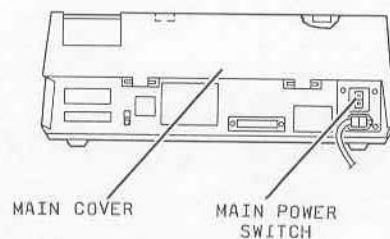


Correct

To Remove the existing LOWER RACK

- [4] If necessary, move the MAIN POWER SWITCH to the "0" position.

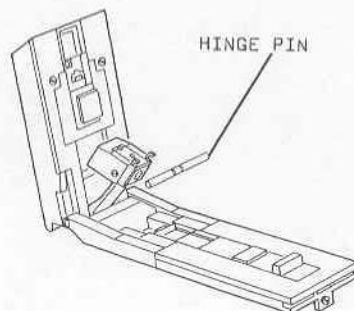
- [5] If necessary, remove the MAIN COVER.



NOTE

Skip step 6 if you have a tool with a similar diameter to the HINGE PIN. Use the tool instead of the HINGE PIN in steps 13 and 14.

- [6] Remove the HINGE PIN.



- [7] Remove:

- 2 SCREWS
- 2 LOCK WASHERS

- [8] If the GROUND STRAP SCREW is in a slot, loosen the GROUND STRAP SCREW.

NOTE

If the GROUND STRAP SCREW is in a hole, remove the GROUND STRAP SCREW.

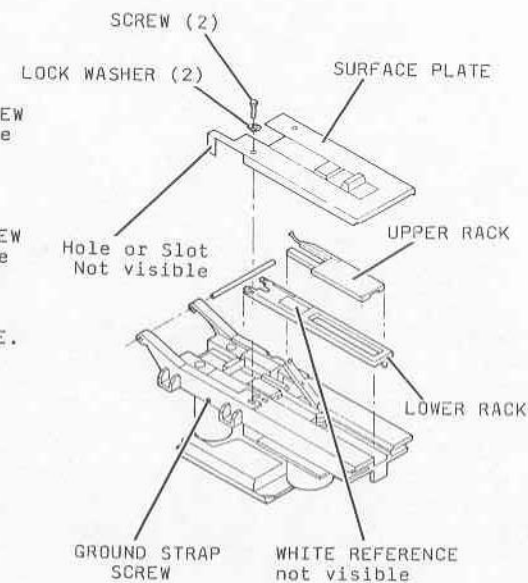
- [9] Remove the SURFACE PLATE.

.....
 • CAUTION •

Do not touch the WHITE REFERENCE.

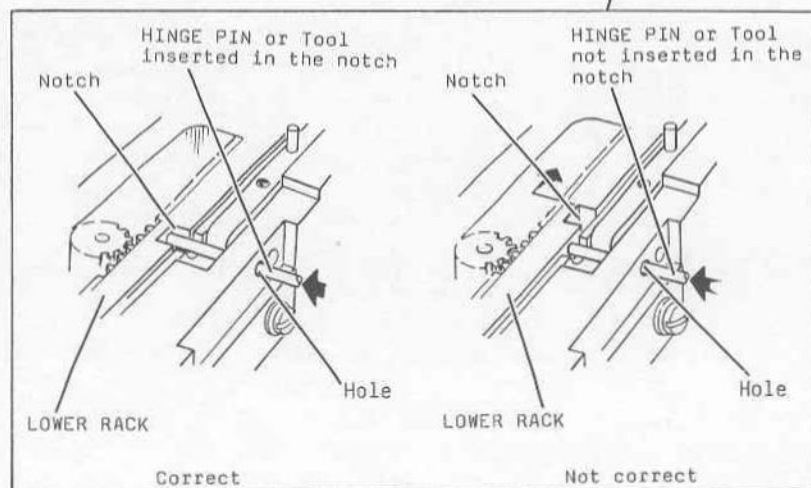
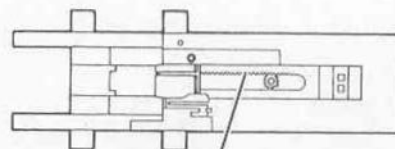
- [10] Remove the UPPER RACK.

- [11] Remove and discard the LOWER RACK.



To Install the new LOWER RACK:

- [12] Place the new LOWER RACK ASSEMBLY 352434 into the ANALYZER.
- [13] Insert the tool or the HINGE PIN into the hole. Manually move the LOWER RACK until the tool or the HINGE PIN is in the notch.

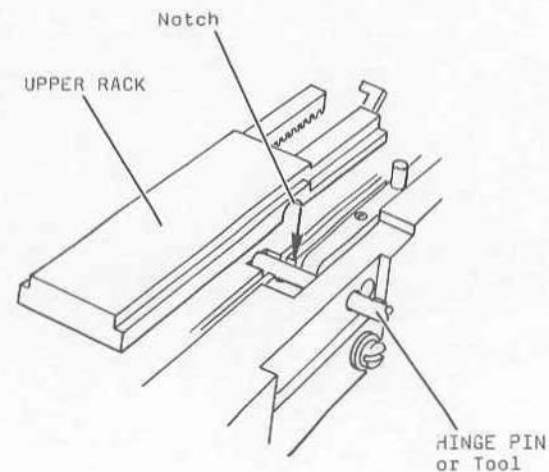


- [14] Install the UPPER RACK with the notch aligned with the HINGE PIN or tool.

NOTE

Do not install the SURFACE PLATE.

- [15] Remove the HINGE PIN or the tool.
- [16] If necessary, install the HINGE PIN into the PIPETTE LOCATOR ASSEMBLY.



Parts Kit Installation Instructions
for the
Kodak Ektachem DT60 ANALYZER
and the
Kodak Ektachem DTE MODULE

<u>Parts Kit</u>	<u>Part No.</u>
ELECTROMETER ASSEMBLY PARTS 352751 - DTE MODULE	352492
PRESSURE PAD Type 2 PARTS ASSEMBLY 352706 - DT60 ANALYZER	352493
UPGRADE KIT (V9.0/M12) - DT60 ANALYZER	352891



INSTALLATION INSTRUCTIONS: ELECTROMETER ASSEMBLY PARTS 352751 for the *Kodak Ektachem DTE Module*

PLEASE NOTE

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Eastman Kodak Company reserves the right to change this information without notice, and makes no warranty, express or implied, with respect to this information. Kodak shall not be liable for any loss or damage, including consequential or special damages, resulting from the use of this information, even if loss or damage is caused by Kodak's negligence or other fault.

CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

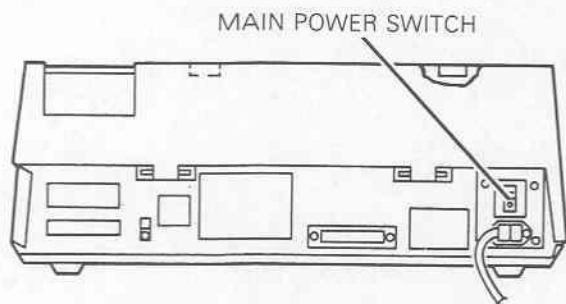
Parts List:

ELECTROMETER ASSEMBLY PARTS 352751 includes:

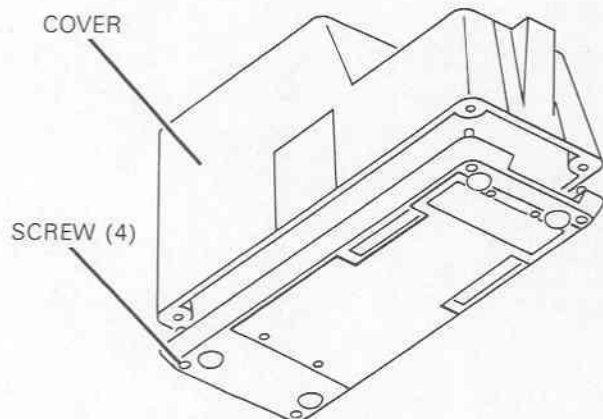
Part No.	Description	Quantity
108543	Nut - Elastic Stop	1
351800	Electrometer Assembly	1
352492	Installation Instructions	1
352709	Mounting Bracket	1

To remove the old ELECTROMETER ASSEMBLY:

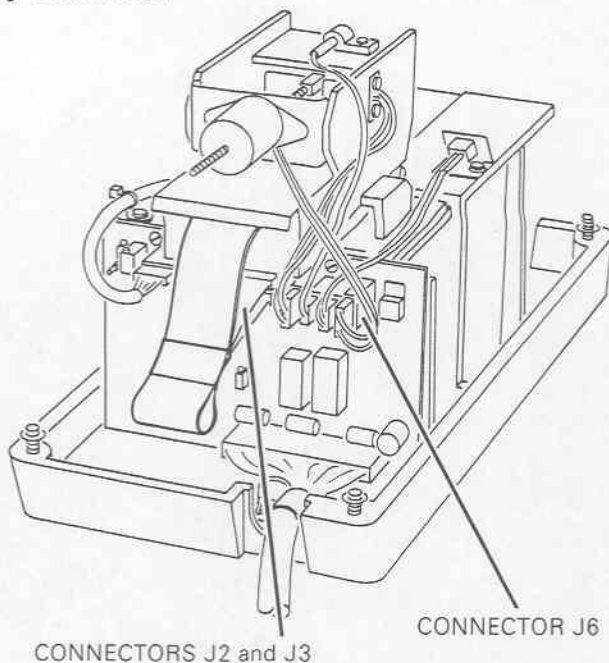
- [1] Move the MAIN POWER SWITCH on the Kodak Ektachem DT60 ANALYZER to the "0" position.



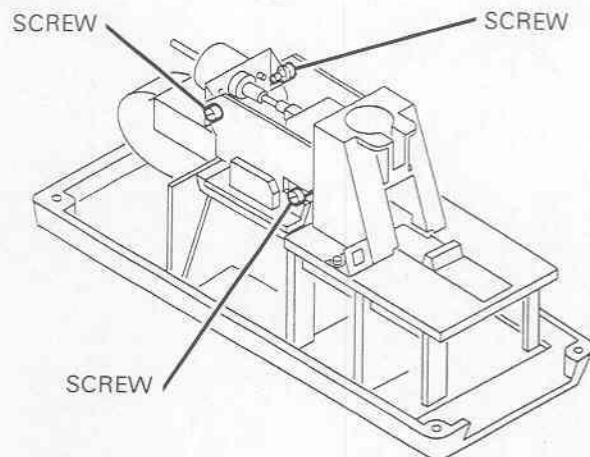
- [2] Remove:



- [3] Disconnect:



- [4] Remove and discard:



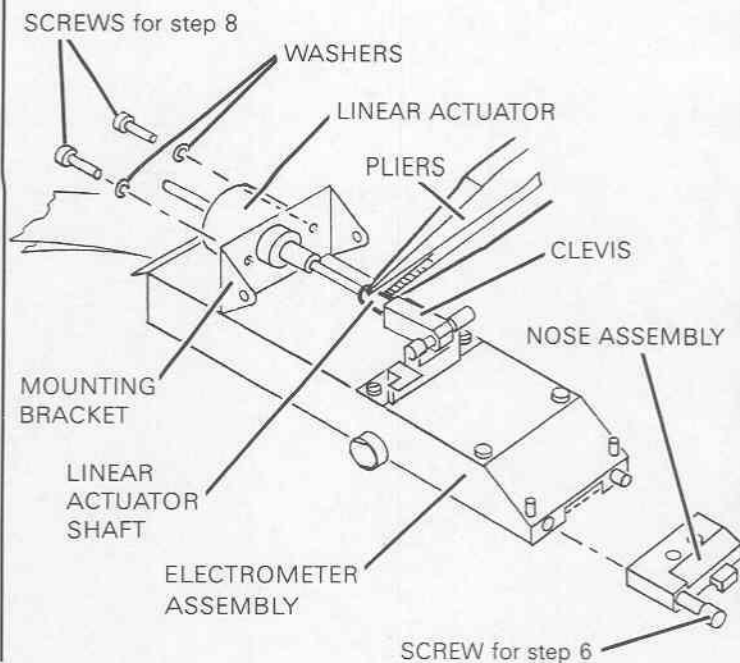
- [5] Remove and keep the old ELECTROMETER ASSEMBLY. See step 22.

- [6] Loosen the SCREW and remove the NOSE ASSEMBLY.

- [7] Use PLIERS to loosen the LINEAR ACTUATOR SHAFT. Remove the LINEAR ACTUATOR SHAFT from the CLEVIS.

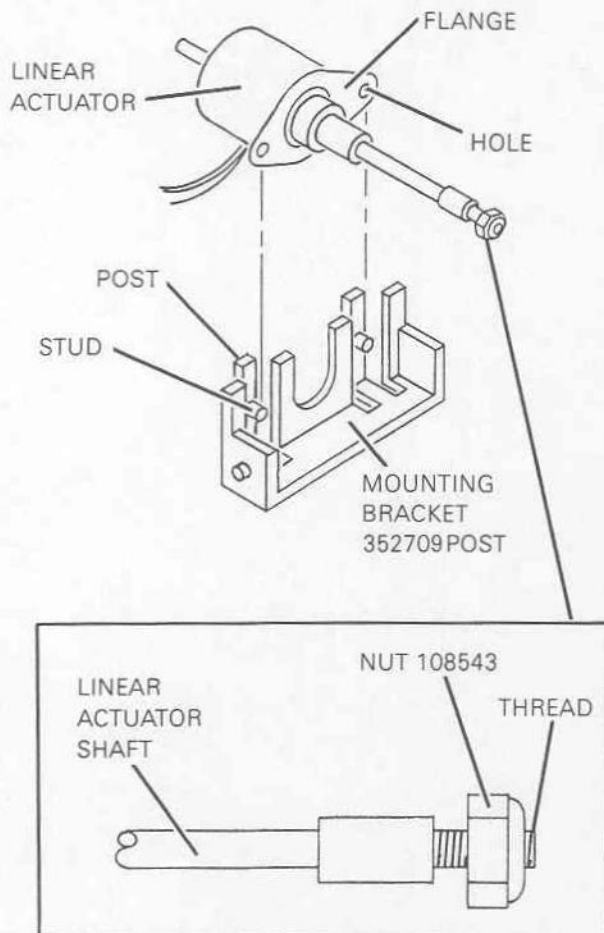
- [8] Remove and discard:
- 2 SCREWS
- 2 WASHERS
- MOUNTING BRACKET

- [9] Keep the LINEAR ACTUATOR.



To install the new ELECTROMETER ASSEMBLY 351800:

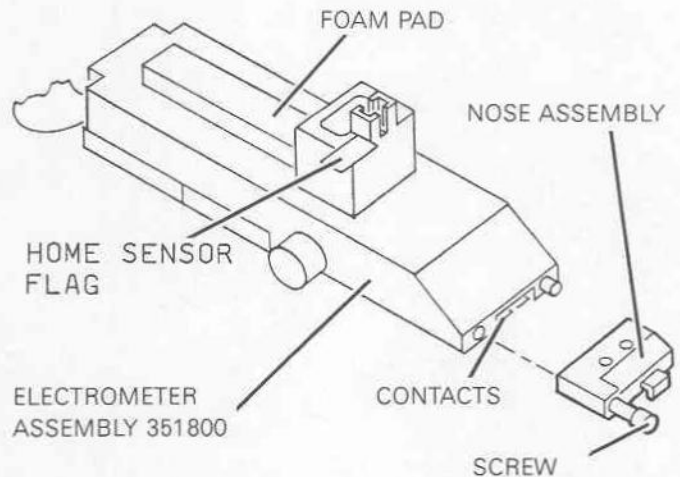
- [10] Install the new NUT 108543 onto the LINEAR ACTUATOR SHAFT. Rotate the NUT until approximately 1 THREAD is extended through the hole in the NUT.
- [11] To install the LINEAR ACTUATOR into the new MOUNTING BRACKET 352709, press the FLANGES on the LINEAR ACTUATOR down between the POSTS on the MOUNTING BRACKET until the STUDS insert into the HOLES in the FLANGES.



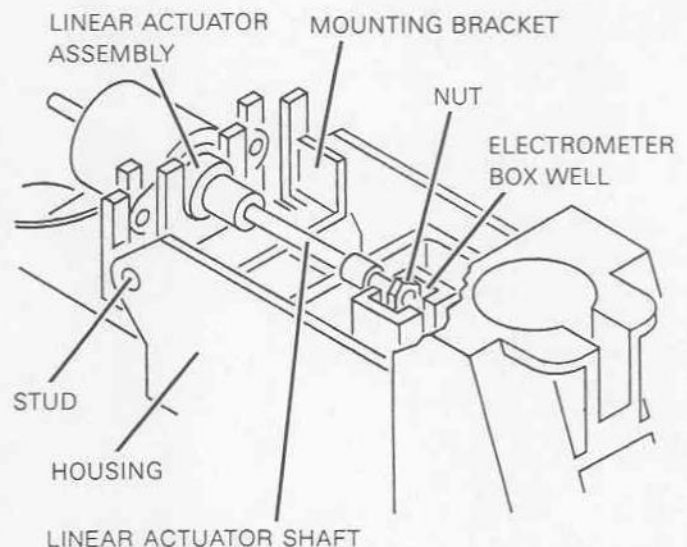
- [12] Install the NOSE ASSEMBLY onto the new ELECTROMETER ASSEMBLY 351800. Tighten the SCREW.

CAUTION

Do not remove the FOAM PAD from the new ELECTROMETER ASSEMBLY. Avoid damage to the CONTACTS and the HOME SENSOR FLAG.



- [13] Install the new ELECTROMETER ASSEMBLY from the back. Do not push the ELECTROMETER ASSEMBLY fully forward.
- [14] To install the LINEAR ACTUATOR ASSEMBLY, do:
- Rotate the LINEAR ACTUATOR SHAFT to allow the NUT to seat in the ELECTROMETER BOX WELL.
 - Press the sides of the MOUNTING BRACKET toward the center and install the STUDS into the holes in the HOUSING.



- [15] Connect:
CONNECTOR J6
CONNECTOR J3
CONNECTOR J2
- [16] Move the MAIN POWER SWITCH to the
"1" position.
- [17] Check that the following adjustment for the
DTE Module is correct:

Adjustment
HOME POSITION SENSOR

IMPORTANT

The compression of the ELECTROMETER CONTACTS is adjusted automatically on the new ELECTROMETER ASSEMBLY. Do not attempt to adjust the ELECTROMETER CONTACTS.

- [18] Check for 4 correct CONTACT MARKS on a potentiometric slide. If necessary, check the horizontal position of the slide. Repair any parts of the slide path as necessary to make the CONTACT MARKS correct.

- [19] Install:
COVER
4 SCREWS

To check the operation of the Kodak Ektachem DTE MODULE:

- [20] Process *Kodak Ektachem* DT CONTROLS for all potentiometric tests used by the customer. If the customer does not use DT CONTROLS, use available CONTROLS. Check that the results are within the value ranges of the manufacturer. If necessary, see "Preparing the Controls" and "Analyzing the Controls" in the section, "Quality Control Testing," and see the section, "Operating Instructions," in the operator's manual.
- [21] If any test results for the processed CONTROLS are not within the correct ranges, do the calibration procedure for those tests only.
- [22] Return the old ELECTROMETER ASSEMBLY to Parts Services in Rochester.

IMPORTANT

Include a description of the problem and the tape printouts. Use the special form provided by Technical Support Services, Clinical Products Division.

KODAK, EKTACHEM, DT60, and DTE are trademarks.

Customer Equipment Services

EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650





INSTALLATION INSTRUCTIONS: PRESSURE PAD Type 2 PARTS ASSEMBLY 352706 for the *Kodak Ektachem DT60 Analyzer*

PLEASE NOTE

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CAUTION



This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Parts List:

PRESSURE PAD Type 2 PARTS ASSEMBLY 352706 includes:

Part No.	Description	Quantity
345280*	Stem	1
345282*	Fan Baffle	1
345284*	Pressure Pad - Type 2	1
352493*	Installation Instructions	1
352605	Spring - Pressure Pad	1

*Not in stock as a separate part in Parts Services.

IMPORTANT

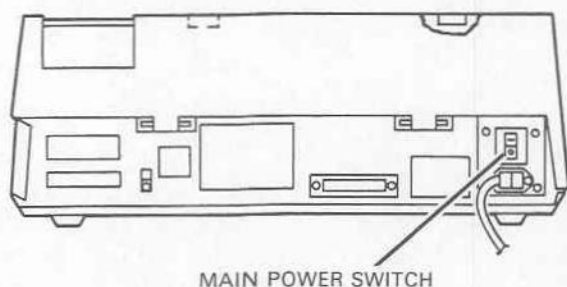
The type 1 and the type 2 PRESSURE PAD ASSEMBLIES are compatible with 3 different configurations of the UPPER INCUBATOR PLATEN.

If you remove a type 1 PRESSURE PAD ASSEMBLY to install this type 2 PRESSURE PAD ASSEMBLY, you must also install the new PRESSURE PAD SPRING and the FAN BAFFLE included in the package. The FAN BAFFLE and the type 2 PRESSURE PAD ASSEMBLY together provide the temperature control necessary for the INCUBATOR.

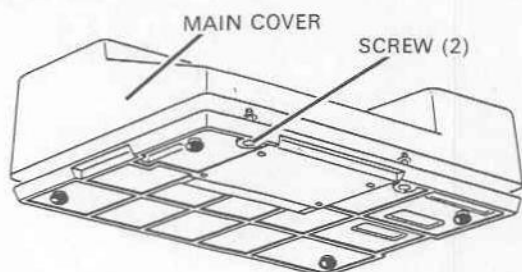
If a type 1 PRESSURE PAD ASSEMBLY is installed again after a type 2 PRESSURE PAD ASSEMBLY has been installed, the FAN BAFFLE **must be removed**. The full power of the FAN is necessary to provide temperature control for the INCUBATOR when the type 1 PRESSURE PAD ASSEMBLY is installed.

Removal of the old PRESSURE PAD ASSEMBLY

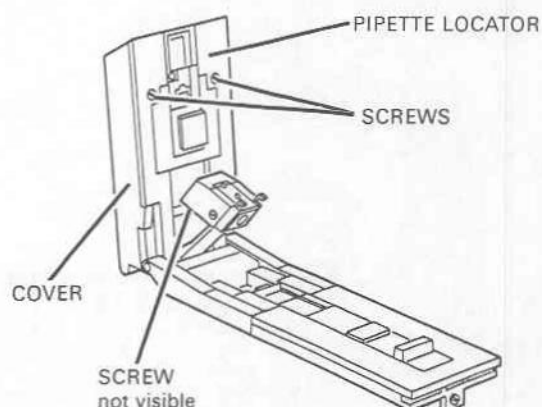
- [1] Move the MAIN POWER SWITCH on the DT60 ANALYZER to the "O" position.



- [2] Loosen the 2 SCREWS and remove the MAIN COVER.

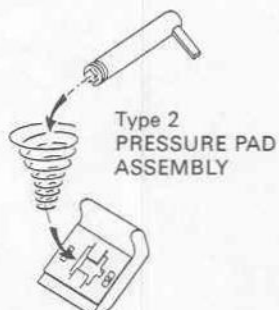


- [3] Lift the PIPETTE LOCATOR. Remove the 3 SCREWS AND THE COVER.

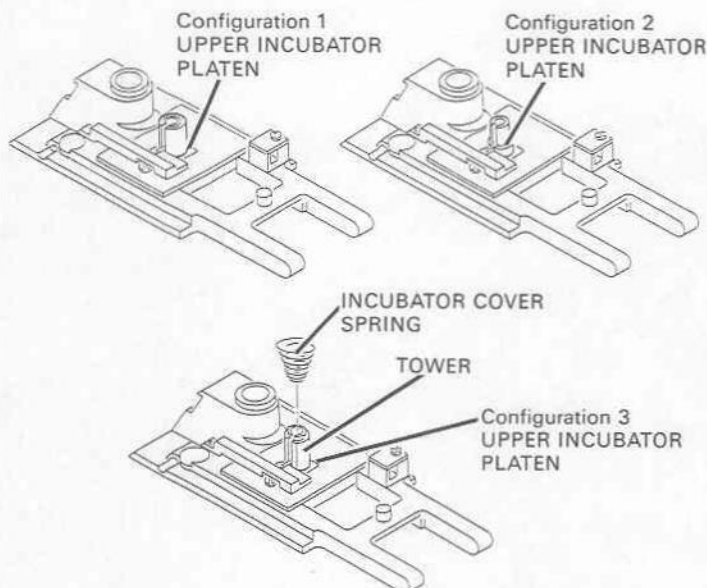


- [4] Compare the existing PRESSURE PAD ASSEMBLY in the DT60 ANALYZER with the following illustrations. Determine if the existing PRESSURE PAD ASSEMBLY is type 1 or type 2.

Type 1
PRESSURE PAD
ASSEMBLY



- [5] Compare the UPPER INCUBATOR PLATEN installed in the DT60 ANALYZER with the following illustrations. Determine if the UPPER INCUBATOR PLATEN is configuration 3 with an INCUBATOR COVER SPRING installed.



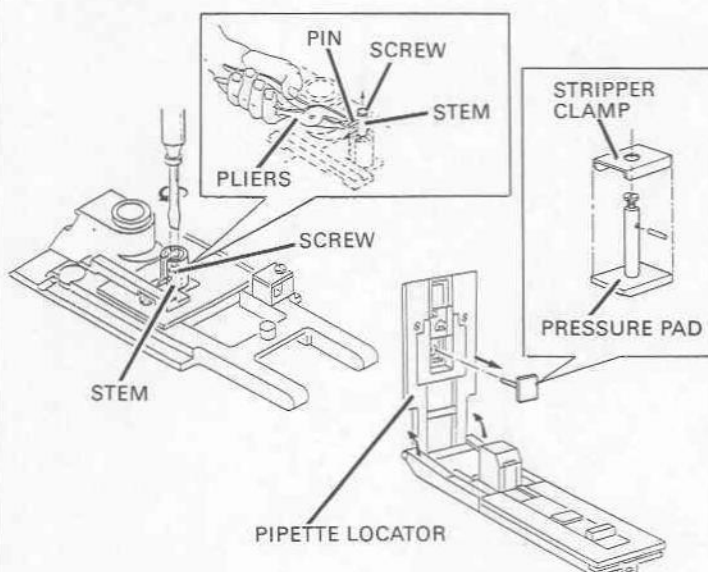
- [6] Remove the PRESSURE PAD ASSEMBLY.

For the type 1 PRESSURE PAD ASSEMBLY:

- Loosen the SCREW on the top of the STEM.
- Use PLIERS and remove the PIN from the STEM. Discard the PIN.
- Lift the PIPETTE LOCATOR. Remove and discard the PRESSURE PAD and the STRIPPER CLAMP.

IMPORTANT

You must install the FAN BAFFLE 345282 for correct temperature control. Step 8 provides instructions for installing the FAN BAFFLE 345282.

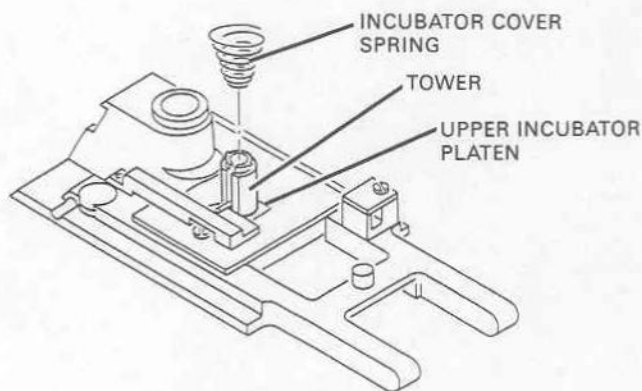


For the Type 2 PRESSURE PAD ASSEMBLY:

- If the UPPER INCUBATOR PLATEN has an INCUBATOR COVER SPRING installed, remove and keep the SPRING.

NOTE

The INCUBATOR COVER SPRING is compatible only with the configuration 3 UPPER INCUBATOR PLATEN.



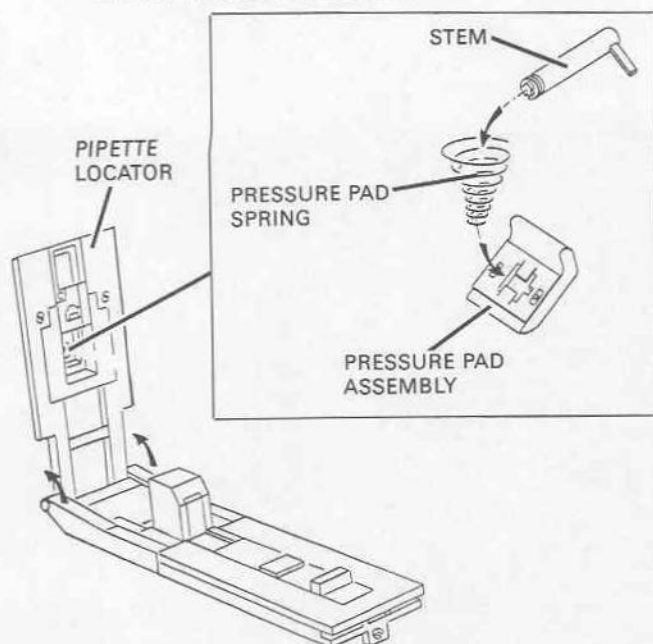
- Lift the PIPETTE LOCATOR.

NOTE

The diameter of the PRESSURE PAD SPRING assembled with the PRESSURE PAD ASSEMBLY is 0.33 mm (0.013 in.).

The diameter of the INCUBATOR COVER SPRING installed on the TOWER of the UPPER INCUBATOR PLATEN is 0.76 mm (0.030 in.).

- Pull apart the PRESSURE PAD and the STEM.
- Remove and discard the PRESSURE PAD SPRING and the PRESSURE PAD.
- Remove the STEM through the top of the TOWER. Discard the STEM.



**Installation of the new Type 2
PRESSURE PAD ASSEMBLY 345284**

NOTE

The type 2 PRESSURE PAD ASSEMBLY 345284 in this package can be installed with all configurations of the UPPER INCUBATOR PLATEN.

CAUTION

Frequent removal and installation of the STEM in the PRESSURE PAD ASSEMBLY can cause damage or wear on the surfaces.

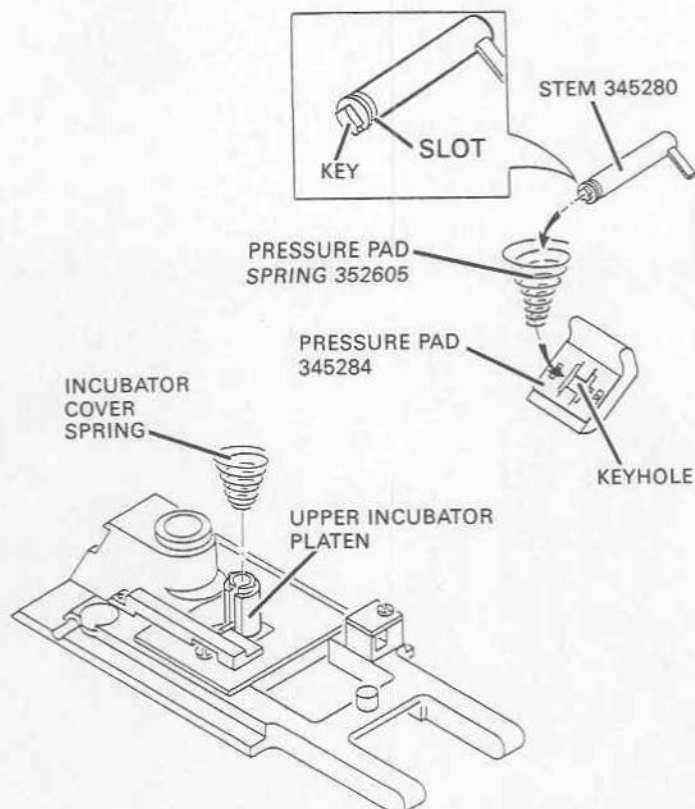
- [7] Insert the STEM 345280 through the top of the UPPER INCUBATOR PLATEN.

- Install the PRESSURE PAD SPRING 352605 onto the bottom of the STEM. The narrow end of the SPRING should be toward the bottom end of the STEM and should seat in the SLOT.

NOTE

Check that the KEY on the STEM and the KEYHOLE in the PRESSURE PAD are correctly aligned.

- Install the PRESSURE PAD onto the end of the STEM. Press the PRESSURE PAD into position on the STEM until it seats and holds.
- Check that the PRESSURE PAD has free motion on the STEM.
- If the UPPER INCUBATOR PLATEN is configuration 3, install the INCUBATOR COVER SPRING on the TOWER.



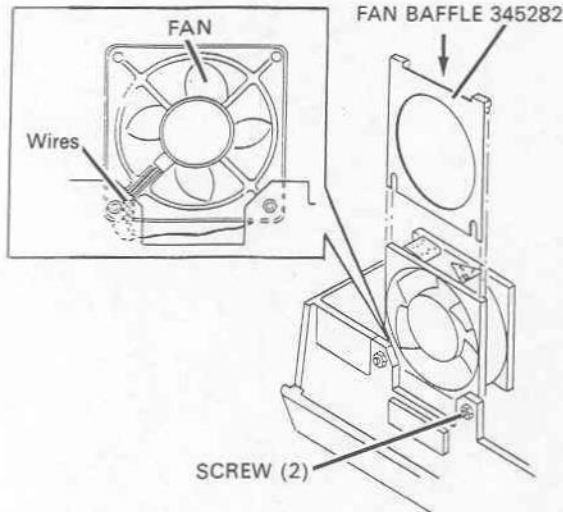
- [8] If you removed a type 1 PRESSURE PAD ASSEMBLY, install the FAN BAFFLE 345282:

- Loosen, but do not remove, the 2 SCREWS.

CAUTION

When you install the FAN BAFFLE, do not damage the wires for the FAN. If necessary, move the wires into a protected position.

- Install the FAN BAFFLE 345282 and tighten the 2 SCREWS.



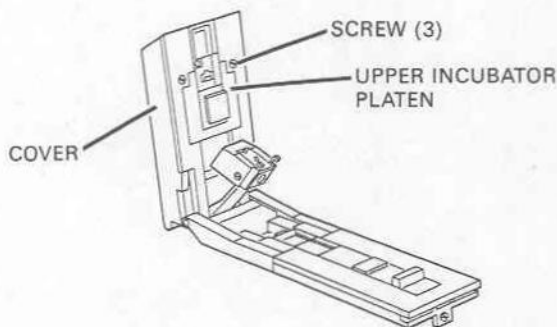
- [9] Check that the following adjustment is correct:

Adjustment
UPPER ARM

IMPORTANT

Check that the UPPER INCUBATOR PLATEN can be moved freely after the COVER is installed.

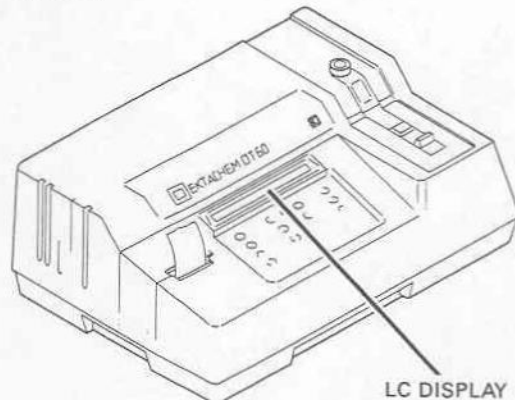
- [10] Install the PIPETTE LOCATOR COVER and the 3 SCREWS.



- [11] Install the MAIN COVER and tighten the 2 SCREWS.

- [12] Press the MAIN POWER SWITCH to the "1" position.

- [13] Wait until the LC DISPLAY displays "ANALYZER READY."



Checking the operation of the Kodak Ektachem DT60 Analyzer:

- [14] Check that the following adjustment is correct:

Adjustment
INCUBATOR - Temperature

- [15] Process *Kodak Ektachem DT CONTROLS* for all colorimetric tests used by the customer. If necessary, see "Preparing the Controls" and "Analyzing the Controls" in the section, "Quality Control Testing," in the Operator's Manual for the *Kodak Ektachem DT60 Analyzer*. Also see the section, "Operating Instructions."

NOTE

The following tests are most sensitive to the temperature variations:

BUN AMYL NH₃ CREA.

- [16] If any test results for the processed CONTROLS are not within the correct ranges, do the calibration procedure for those tests only.

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Customer Equipment Services

EASTMAN KODAK COMPANY • ROCHESTER, N.Y. 14650



Printed in USA



Part No. 352891
4/88

INSTALLATION INSTRUCTIONS:

UPGRADE KIT (V9.0/M12)
for the
Kodak Ektachem DT60 ANALYZER

IMPORTANT

Use "M12" for technical feedback to SCAN.
Do not use any part Nos. for feedback to SCAN.

Service Code: 3100

Type 2

Purpose

Installation of this kit allows a customer to connect a Kodak Ektachem DTSC MODULE to the DT60 ANALYZER, provides version 11.0 software, and provides RS232 communication for the interface with a laboratory computer.

IMPORTANT

Use qualified personnel to install this modification.

Service Effects: The new parts are added to the Parts List. Because the software is changed from version 9.0 to version 11.0, the service procedures for version 11.0 should be used in the service publication.

Special Requirements: Modifications M2, M4, and M6 must be installed in the ANALYZER before installing the UPGRADE KIT.

Serial Numbers: 60002179 to 60002999, 600003017 to 60003999. The UPDATE KIT can also be installed on serial numbers 60000100 to 60002178 if modifications M2, M4, and M6 are installed in the ANALYZER.

Installation Time: Approximately 1 hour.

Special Materials: 2 small WIRE TIES 428631
100-GRIT SANDPAPER, available locally
CALIBRATION LABEL, Publication No. XP3100-28

Parts Status: DTSC MODULES with UPGRADE KITS will be available during week 15, 1988. The UPGRADE KITS are available from Distribution, but are not available from Parts Services.

Parts Requirements: See the parts list on page 3.

Canadian Job Code: 04.

Special Instructions: The customer purchases the UPGRADE KIT (V9.0/M12) with a DTSC MODULE. This kit can not be obtained as a separate item.

This kit should be installed as necessary when a DTSC MODULE is installed.

: CAUTION :



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Parts List:

UPGRADE KIT (V9.0/M12) includes:

Part No.	Description	Quantity
	KODAK EKTACHEM DT Pipette	1
	Operator's Manual	1
351449	Address Harness Assembly	1
351637*	Data Plate	1
352399	CDM/CLM Board with Heater Harness	1
352487	CPU Circuit Board - Version 11.0	1
352520	I/O Circuit Board	1
352591*	CLM, No. 504**	1
352592*	CDM, No. 0022**	1
352599*	Label - "Exchange Part" NOTE: The LABEL is attached to this procedure.	1
352891*	Installation Instructions	1
613872*	Label - "Caution High Leakage"	1

* Not available from Parts Services stock.

** The numbers for the CDM and the CLM are correct at the time this procedure is published. Because the CDM and the CLM are occasionally revised, the numbers indicated on the packages for the CDM and the CLM might be different from the numbers in the description for the part.
If you have questions, call the Clinical Products Customer Support Center in Rochester, 800/521-0098.

[1] Open the kit and check that all necessary parts are included.
See the parts list on page 3.

[2] Enter option 13 and record the software version installed in the DT60 ANALYZER. Is the software version 9.0?



Advance to
step 4.



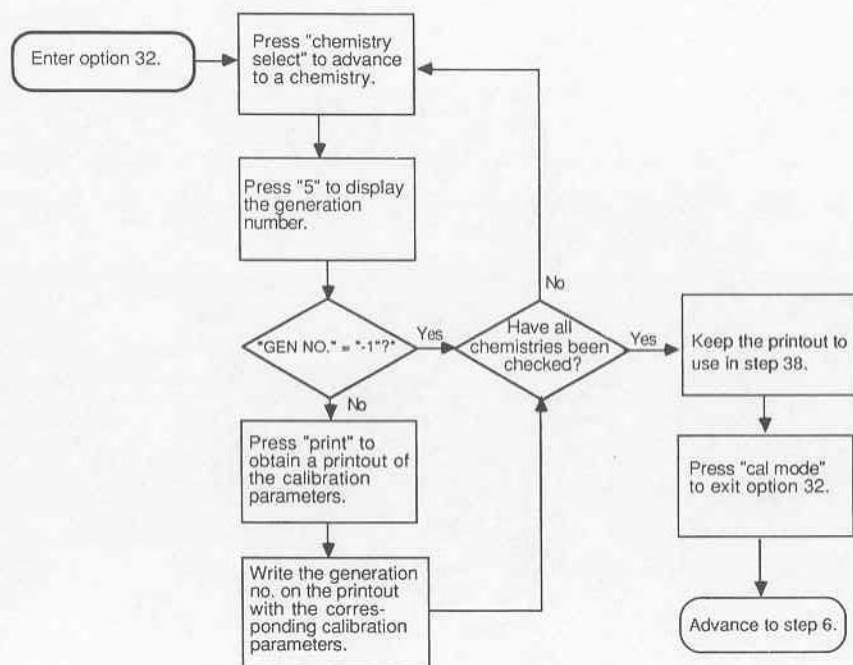
Advance to
step 3.

[3] Obtain help from local Marketing personnel. The UPGRADE KIT cannot be installed in equipment with version 8.3 or 8.4 software, and is not necessary with versions 10.7 and 11.0 software.

In steps 4 and 5, you will obtain data from the existing NONVOLATILE RAM. That data will be entered into the new NONVOLATILE RAM in steps 33 and 34.

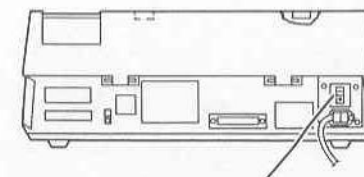
[4] Enter option 36 to obtain a printout of the correction factors and the reflectance values for all colorimetric chemistries calibrated on the DT60 ANALYZER.

[5] Do the following procedure to obtain calibration parameters for calibrated chemistries:



* A generation number of "-1" indicates that no calibration parameters exist for the chemistries selected.

[6] Move the MAIN POWER SWITCH down to the "0" position.

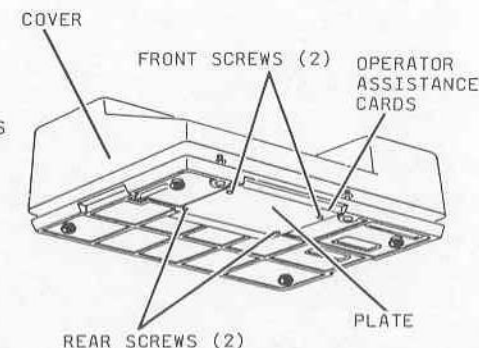


MAIN POWER SWITCH

[7] Remove and discard:

- 2 rear SCREWS.
- 2 front SCREWS.
- PLATE
- OPERATOR ASSISTANCE CARDS

[8] Remove the COVER.

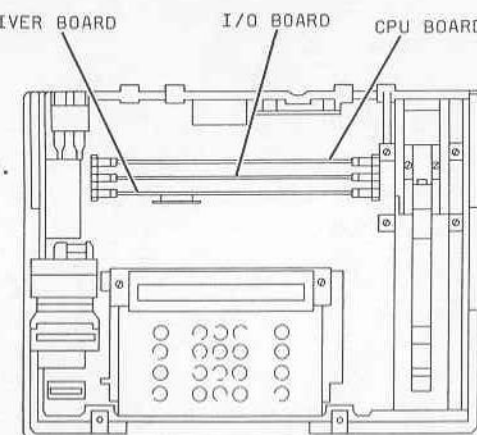


.....
CAUTION
.....

Possible damage from electrostatic discharge.

[9] Remove:

- DRIVER BOARD
- I/O BOARD
- CPU BOARD

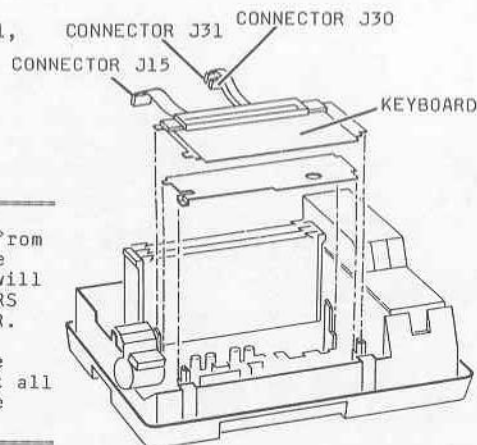


- [10] Disconnect CONNECTORS J31, J30, J15.

- [11] Remove the KEYBOARD.

In steps 12 to 23, you will change the path of the wires from the FORS WEIGHT HEATER and the PIPETTE LOCATOR. Doing this will allow free movement of the FORS WEIGHT and the PIPETTE LOCATOR.

In some ANALYZERS, if the wire paths are already correct, not all of the following steps will be necessary.



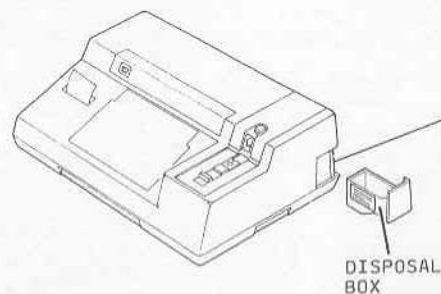
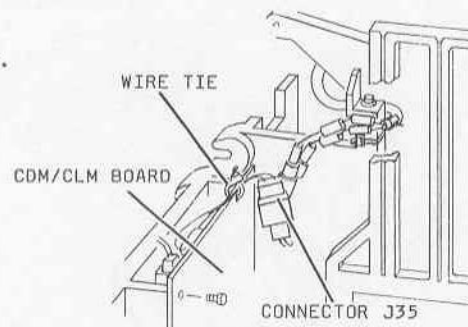
- [12] Cut the WIRE TIE.

- [13] Disconnect CONNECTOR J35.

- [14] Remove and discard the CDM/CLM BOARD.

- [15] Remove:

- DISPOSAL BOX
- FORS GUARD

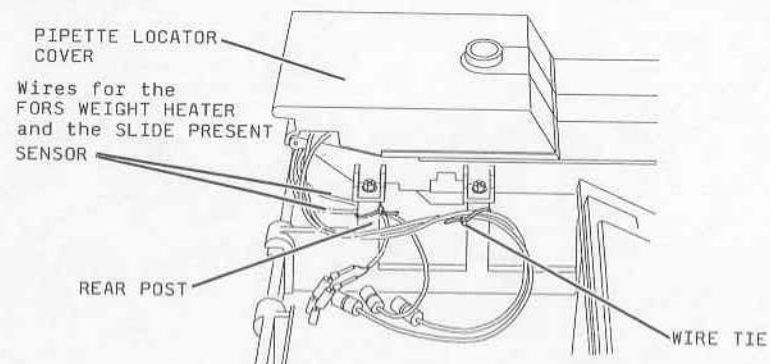


- [16] Place the wires for the FORS WEIGHT HEATER and the SLIDE PRESENT SENSOR in the position behind the REAR POST. See the figure below.

- [17] Install, but do not tighten, a WIRE TIE around the REAR POST and the wires. See the figure below.

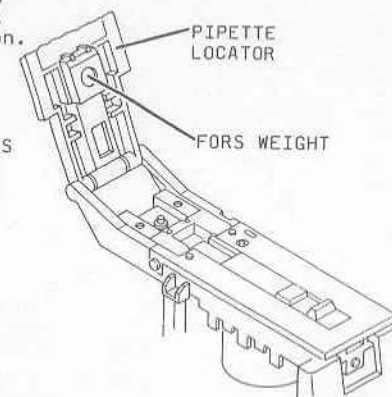
IMPORTANT

The PIPETTE LOCATOR COVER must be installed before you do step 18.



- [18] Open the PIPETTE LOCATOR and lift the FORS WEIGHT so that it remains in the up position.

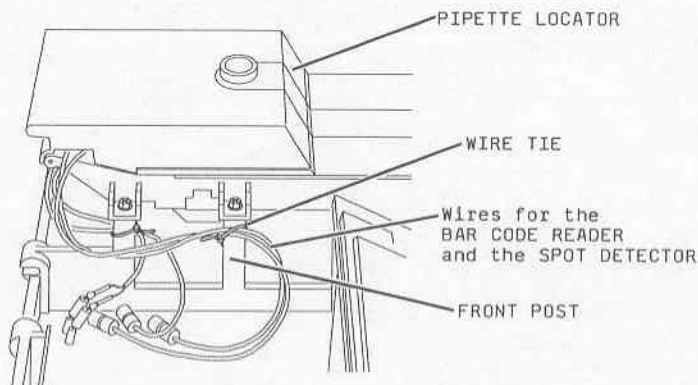
- [19] With FORS WEIGHT in the up position, adjust the length of the wires between the FORS WEIGHT and the REAR POST so that the wire loop is not excessively large. Tighten the WIRE TIE.



[20] Place the wires for the BAR CODE READER and the SPOT DETECTOR in the position on the outside of the FRONT POST. See the figure below.

[21] Install, but do not tighten, a WIRE TIE around the FRONT POST and the wires. See the figure below.

[22] With the PIPETTE LOCATOR in the up position, adjust the length of the wires between the PIPETTE LOCATOR and the FRONT POST so that the wire loop is not excessively large. Tighten the WIRE TIE.

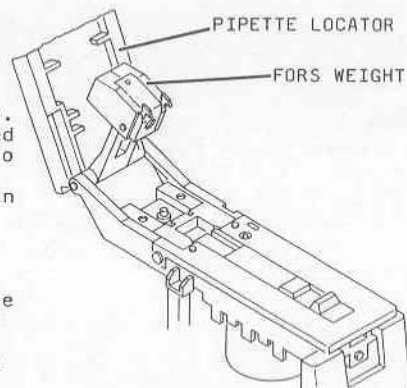


[23] Check:

- the PIPETTE LOCATOR can be lifted and moved down freely.
- the FORS WEIGHT can be lifted and moved down freely with no obstructions.
- the FORS WEIGHT can remain in the up position when the PIPETTE LOCATOR is up.

NOTE

If the wires are too short, the FORS WEIGHT will not remain in the up position.
If the wires are too long, the loop that is made when FORS WEIGHT is down might obstruct the movement of the FORS WEIGHT.



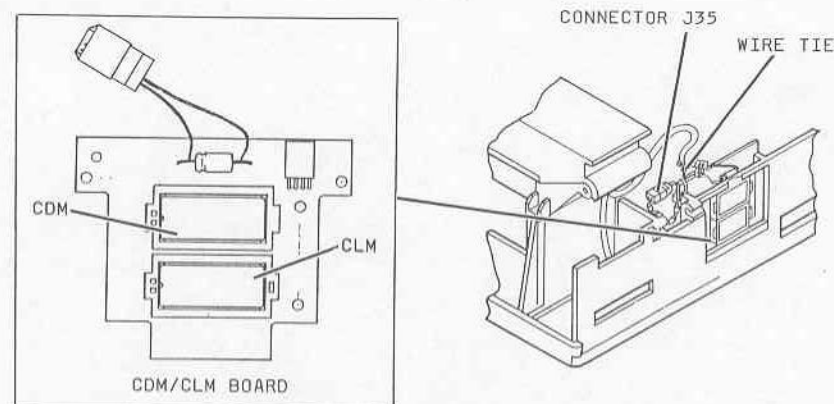
[24] Install in the new CDM/CLM BOARD 352399:

- CLM 352591
- CDM 352592

[25] Install the new CDM/CLM BOARD 352399.

[26] Connect CONNECTOR J35 from the FORS WEIGHT HEATER to the CDM/CLM BOARD.

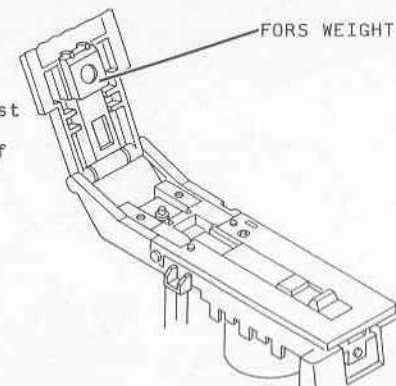
[27] Use a WIRE TIE to attach CONNECTOR J35 to the CDM/CLM BOARD.



[28] Check that the FORS WEIGHT can be lifted fully.
If necessary, move or adjust the length of the wire to enable the free movement of the FORS WEIGHT.

[29] Install:

- FORS GUARD
- DISPOSAL CUP

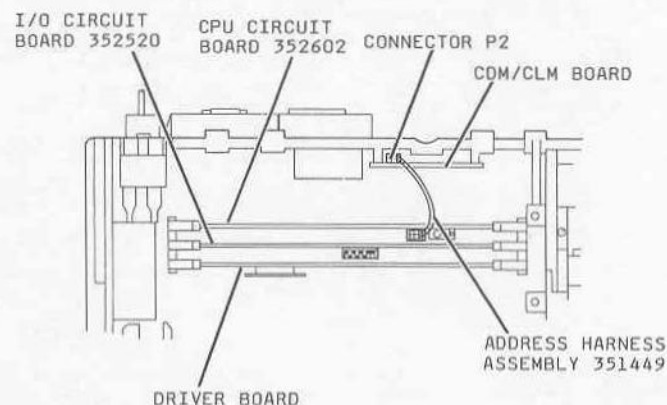


[30] Install:

- DRIVER BOARD
- new I/O CIRCUIT BOARD 352520
- new CPU CIRCUIT BOARD 352602

[31] Connect the new ADDRESS HARNESS ASSEMBLY 351449 to CONNECTOR P2 on the CDM/CLM BOARD.

[32] Connect the other end of the ADDRESS HARNESS 351449 to CONNECTOR P3 on the CPU BOARD.



[33] Use antistatic material and pack the old I/O BOARD and the old CPU BOARD.

[34] Fasten the "EXCHANGE PART" LABEL 352599 onto the package, and return the I/O BOARD and the CPU BOARD to Parts Services.

NOTE

The LABEL 352599 is attached to this procedure.

[35] Connect CONNECTORS J31, J30, and J15 for the KEYBOARD.



"EXCHANGE PART" LABEL 352599

[36] Complete the installation of the KEYBOARD.

[37] Move the MAIN POWER SWITCH up to the "1" position.

[38] Do the following procedure to clear data from the NONVOLATILE RAM:

- Enter option 73.
- Enter "1" to initialize the memory and reset the checksum.
- Move the MAIN POWER SWITCH down to the "0" position.
- Wait 5 seconds.
- Move the MAIN POWER SWITCH up to the "1" position.
- Check that "D19-MEMORY TEST" appears on the printout. This message indicates that the NONVOLATILE RAM is cleared.

[39] Do the following procedure to enter correction factors from the printout obtained in step 4:

- Enter option 81. The existing correction factor for the first LED will be displayed.
- Press "clear" to delete the existing value.
- Enter the new correction factor. Use the value from the printout obtained in step 4.

IMPORTANT

Check that you correctly entered negative signs and decimal points.

- Continue this procedure until you have correctly entered all 6 correction factors.

NOTE

The printout for option 36 obtained in step 4 also includes slide reflectances. The slide reflectance data is not necessary for this procedure.

[40] Do the following procedure to enter the calibration parameters and the generation numbers for the each of the chemistries selected in step 5:

- Enter option 32.
- Press "chemistry select" to advance to the first chemistry you will revise.
- Press "1" to display the existing calibration parameter for the first level.
- Press "clear" to clear the first calibration parameter.

- Enter the calibration parameter from the printout obtained in step 5.
- Press "2", "3", and "4", if necessary, to advance to each additional level. Press "clear" each time and enter the new calibration parameter from the printout.

NOTE

Only CREA has a "Level 4" calibration parameter.

- Press "5" to display the existing generation number for the chemistry.
- Press "clear" to delete the generation number.
- Enter the generation number from the printout obtained in step 5.
- Press "print" to obtain a printout of the calibration parameters you entered.

NOTE

The software might change the value of the number in the last decimal position of the calibration parameters you entered. This could cause the calibration parameters on the printout to be slightly different from the values you entered.

- Check the printout to determine that you entered the calibration parameters correctly. Note the decimal points and negative signs.
- Write the date on the printout and keep it with the Operator's Manual at the customer site. To decrease the time necessary for future service calls, this information should be available if a malfunction clears the computer memory.
- Press "chemistry select" to advance to the other chemistries you will revise.
- Continue this procedure until all the calibration parameters from the printout have been entered.
- Press "calibration mode" to enter the new values to the NONVOLATILE RAM and to calculate new checksums.

NOTE

A delay will occur after "calibration mode" is pressed. This delay is normal, and is caused by the calculation of the new checksum.

[41] Install the COVER.

- [42] Determine if the customer wants the results of the test for "Blood Urea Nitrogen" indicated as "UREA" or "BUN". Also, determine if the customer wants the results indicated as "mg/dl" or "mmols/L". See the following table and enter the correct options.

Options	Test Results
63 and 92	UREA, mg/dl
64 and 92	-
63 and 93	BUN, mg/dl
64 and 93	UREA, mmols/L

- [43] Do the DR Procedure for Version 11.0 Software. See the Adjustments/Special Procedures section of the service publication.

- [44] Execute option 36 to obtain a printout of the correction factors and the slide reflectances.

- [45] Write the date on the printout. Keep the printout with the Operator's Manual at the customer site. If this data is available for you or another FE when a malfunction clears the computer memory, the time necessary for future service calls might be decreased.

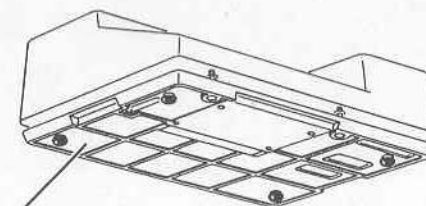
- [46] Is a DATA PLATE installed on the bottom of the DT60 ANALYZER?



Advance to step 53.



Advance to step 47.



DATA PLATE

- [47] Remove the existing DATA PLATE.

IMPORTANT

Use a BALLPOINT PEN and apply pressure when you write the serial number.

- [48] Write the serial number of the ANALYZER on the new DATA PLATE 351637.
- [49] To help the new DATA PLATE to adhere, use 100-GRIT SANDPAPER to remove the paint in the area where the new DATA PLATE will be installed.
- [50] Use water and clean the paint dust from the area. Then allow the area to dry fully.
- [51] Attach the new DATA PLATE 351637. See the figure on page 14. Place the DATA PLATE so that the top is toward the front of the ANALYZER. You should be able to read the DATA PLATE when you lift the front end of the ANALYZER.

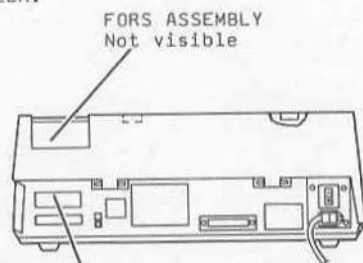
- [52] Do the following procedure to attach the "CAUTION HIGH LEAKAGE" LABEL 613872:

.....
: CAUTION :
.....

Do not allow paint dust to contaminate the area of the Read Station or the FORS ASSEMBLY.

- Use 100-GRIT SANDPAPER to make the paint surface smooth in the area on the back of the CHASSIS where the LABEL will be installed. This step will help the LABEL to adhere.

- Attach the LABEL.



CAUTION
HIGH LEAKAGE CURRENT
ENSURE PROPER GROUNDING
ATTENTION
COURANT DE FUITE ÉLEVÉ
FOURNIR UNE MISE A LA TERREEFFICACE

"CAUTION HIGH LEAKAGE" LABEL

In steps 53 to 55, you will exchange the new Kodak Ektachem DT PIPETTE 352400 included in the UPDATE KIT (V9.0/M12) with the old style DT PIPETTE now used at the customer site.

The customer should receive credit for any additional old style DT PIPETTES at the site that were purchased.

If the customer has additional old style DT PIPETTES that were not purchased, they should be removed from the customer site and no credit should be given.

2 styles of DT PIPETTE have been provided to customers. The new style DT PIPETTE has a "pullback" feature. You can determine if the DT PIPETTE at the customer site is an old or new style.

Press the PIPETTE BUTTON. The old style PIPETTE makes no "beep" sound when the BUTTON is pressed. If the PIPETTE is the new "pullback" style, the PIPETTE makes one "beep" sound when the PIPETTE BUTTON is pressed and an additional "beep" sound 2 seconds after the first sound.

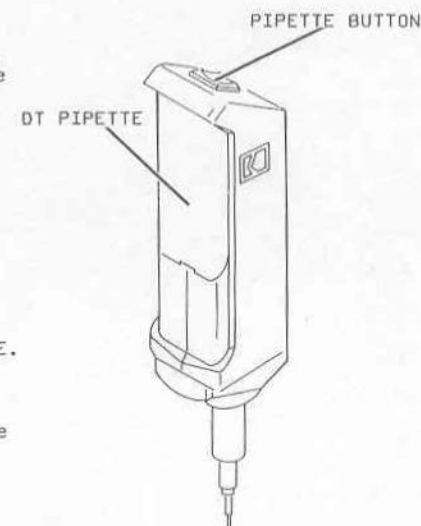
- [53] Remove the new DT PIPETTE 352400 from the CARTON.

- [54] Give the new DT PIPETTE and the OPERATOR'S MANUAL to the customer. If necessary, explain the difference between the old and the new PIPETTES.

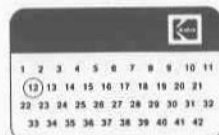
IMPORTANT

The old style DT PIPETTE might cause errors if it is used to meter the sample fluid for the chemistries processed on the DTSC MODULE.

- [55] Remove from the site and discard all old style DT PIPETTES that do not have the "pullback" feature.



[56] Circle:



[57] When the service call is completed, provide the following information to SCAN:

Service Code	3100
Purpose Code	M12
Part Kit No.	None*

* Do not indicate any costs for parts. Only labor hours should be indicated for the installation on this service call. The parts are included in the cost of the Kodak Ektachem DTSC MODULE purchased by the customer.

IMPORTANT

Removing the PIPETTE LOCATOR COVER is not necessary for this procedure. If you did remove and install the COVER, you must do the height adjustment for the TIP SEAT before doing the following steps. See the Adjustments and Special Procedures, section 8, in the service publication for the DT60 ANALYZER.

Use the new DT PIPETTE in steps 58 and 59.

[58] Use Control Fluids and process slides for all chemistries that have calibration parameters stored in the memory. See steps 5 and 40.

[59] If the results for any chemistry or chemistries indicate a "shift" in the values for the controls, a full wet calibration should be done.

IMPORTANT

If the calibration is done by a Kodak employee, a CALIBRATION LABEL, Publication No. XP3100-28, must be applied to the call report. The customer should be asked to read and sign the LABEL.

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